4.11.20.

Vol. XVIII. Part 8.

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The Journal of the Department of Agriculture of Victoria, Australia.

August, 1920.

PRINCIPAL CONTENTS

Royal Agricultural Society's Farm Competition

— Judge's Report —

Twenty Years' Experience of Reconstitution of Vines

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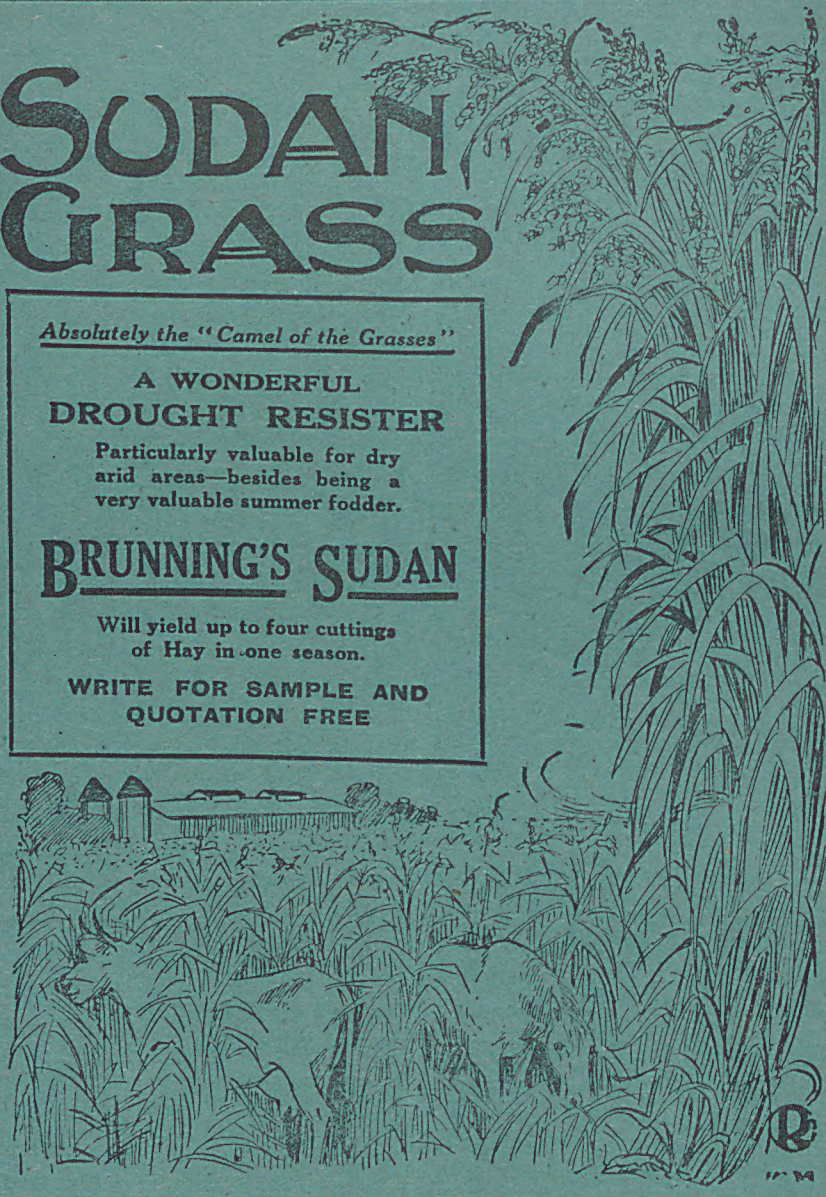

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NATIONAL MUSEUM MELBOURNE

CONTENTS.—AUGUST, 1920.

		PAGE
Royal Agricultural Society's Farm Competition—Report of the Judge		449
Twenty Years of Reconstitution	*F. de Castella*	481
Fish Manure (*continued*)	*P. Rankin Scott and W. C. Robertson*	493
Agricultural Societies' Work	*J. S. McFadzean*	499
Australian Egg Records	*A. V. D. Rintoul*	502
Farm Notes for July		504
Wool Table—Design for		506
Orchard and Garden Notes		508
Reminders for September		510

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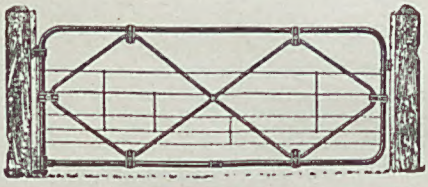

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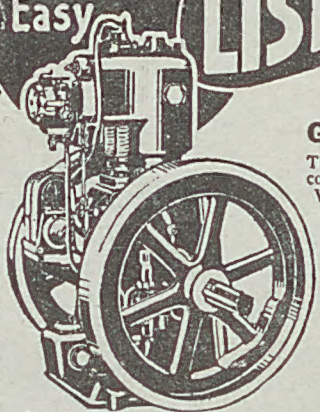

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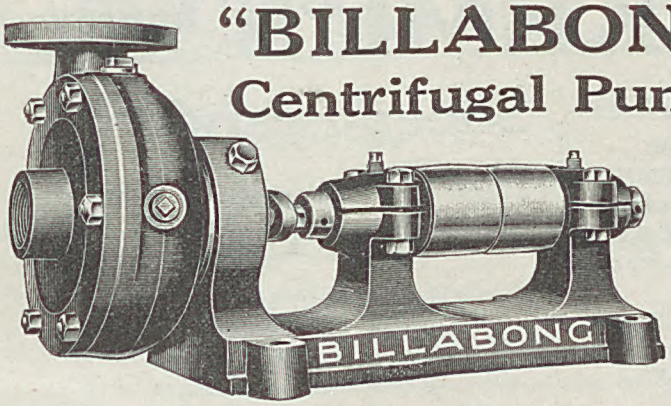

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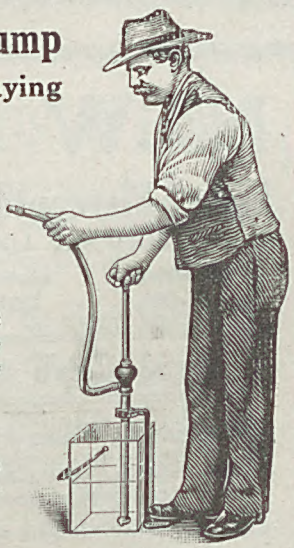

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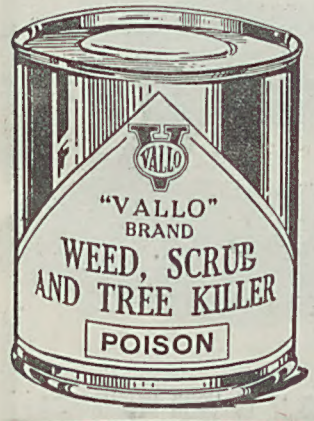

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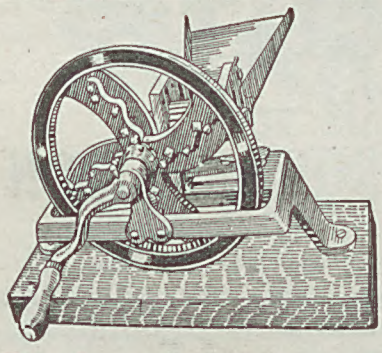

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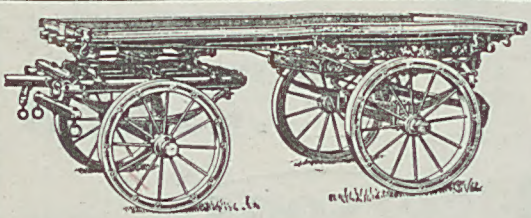

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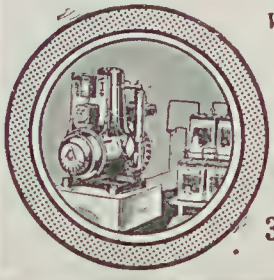

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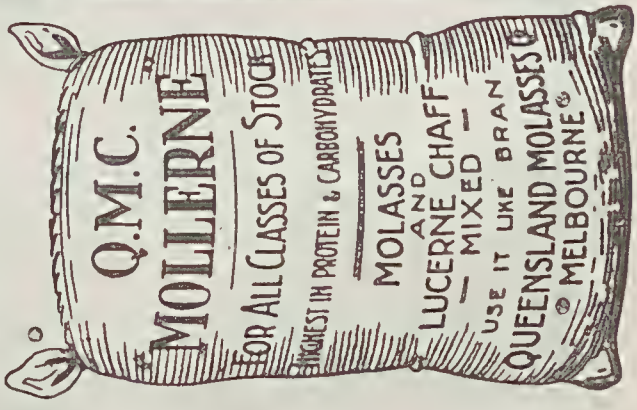

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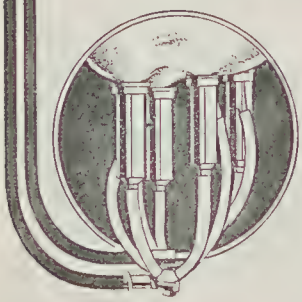

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OF THE

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OF

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Vol. XVIII. 21st August, 1920 Part 8.

ROYAL AGRICULTURAL SOCIETY'S FARM COMPETITION.

Prizes, £100.

Report of the Judge, Mr. H. A. Mullett, B. Ag. Sc., Chief Field Officer, Department of Agriculture.

In presenting my report as judge of the first Farm Competition conducted by the Royal Agricultural Society, may I be permitted to commend the society on its adoption of this particular method of advancing the agricultural practice of the State.

In districts where farm competitions have been regularly conducted very definite benefits have been obtained. Improved methods of cropping practice have been disseminated, and farmers have been induced to improve their homes and the farm environment generally.

In the Nhill district competitions have been in progress during the past seventeen years. Perhaps no better example can be given to illustrate the advancement that has been made there than that shown in the following table prepared from the judges' estimates of the yields of the wheat crops submitted to them. The table shows that the estimated yields of all crops exhibited in the section "Best half of farmer's wheat crop" for the five years 1903-07 was 18 bushels per acre; for the next five years it was 26 bushels per acre; while for the period 1915-19 it was 28 bushels—a total average increase of no less than 10 bushels per acre. This illustrates solid progress, in which the competition has played its part. Equally significant is the large number of up-to-date homes and gardens that one finds in the district.

Table showing Average estimated Yields, in Quinquennial Periods, of Wheat Crops shown in the Nhill Farm Competition in the Section "Best Half of Farmer's Wheat Crop."

Year.	Average.	Quinquennial Average.
1903	16¾ bushels	18 bushels.
1904	16 „	
1905	20 „	
1906	20 „	
1907	19½ „	
1908	21½ bushels	26 bushels.
1909	Not available	
1910	29 bushels	
1911	24½ „	
1912	24½ „	
1913	29½ „	
1914 (drought)	No competition.	
1915	30 bushels	28 bushels.
1916	29 „	
1917	27½ „	
1918	28 „	
1919	26 „	

Scope of Royal Competition.

Hitherto the local agricultural societies have been more concerned with revenue-producing activities, such as district shows, than with educational movements which, in addition to organization, require the expenditure of funds.

The Royal Society's competition will be a powerful factor in stimulating greater interest in the latter movement. The handsome prize of £100, and the stipulation that no competitor is eligible to compete unless he has won a prize in a local competition will induce an increasing number of societies to hold competitions. It has already done so.

The fact that it has not been possible in the past to make an investigation of the business activities of each competing farm has been a source of weakness in determining the best farming practice. Owing to the handsome prize money offered, competitors can now be readily induced to supply the judge with the authentic confidential records required.

Judging the Local Competitions, 1919.

For several years past four Wimmera societies have held competitions. Last year two more districts decided to enter. Local competitions were therefore held by the following agricultural societies in the counties of Lowan, Borung, Millewa, Weeah, and Karkarook, to which the competitions were limited:—

Dimboola, Nhill, Rupanyup, Minyip, Goroke — Wimmera.
Ouyen—Mallee.

Ouyen was the only centre in which the local contest took the form of a farm competition; elsewhere crops and fallows only were judged.

View of the Winning Farm, "Ellerslie," the Home of Mr. Walter E. Dahlenburg, Salisbury.

In all there were 111 separate entries in the different sections from fifty-nine separate farms. The judging of these occupied me fully for about a month in November and early December, and, apart from train journeys involved, necessitated 1,000 miles of road travelling between the farms. Some 10,000 acres of wheat and a similar quantity of fallow were subjected to detailed examination and classified. The exhibitors were closely questioned as to their farming methods, and complete records were taken. A list of eligible competitors was then presented to the Royal Society.

Attractive Entrance to "Banavie", the Residence of Mr. D. N. McLennan, Marnoo, who received Second Prize.

Judging the Royal Competition.

This took place during last March. The farms of ten competitors who had qualified for entry by winning a first or second prize in a local competition were inspected.

Points were allotted according to the scale set out in the Society's show schedule—

Summary.

Crops and stock	100
Machinery, buildings, and plant ..	100
The farm as a business and a home ..	100
	300

The marks for crops and fallows were awarded at the local competition at harvest time and carried forward. An average of one and a half days was spent at each farm, and a detailed inspection made of each department. Special attention was paid to the business investigations, and competitors were requested to furnish in confidence their income tax schedules for the past three years, together with evidence of having paid the tax thereon. From these the returns and expenditure from each department of the farm were ascertained.

In addition, a valuation of the land and improvements, plant, and implements, live stock, and fodder reserves was made in order to arrive at the capital outlay, and hence the "labour income" of the farm.

The areas of the farm varied from 640 acres to well over 4,000 acres. The majority were, however, wheat farms of from 640 to 1,500 acres. Two of the largest were really small sheep stations on which a proportion of cultivation was practised. One of the smallest was a new Mallee farm.

On two of the farms, viz., those of Messrs. Muller and Gniel, no sheep were kept. In the first case, the owner specialized in breeding horses, while in the second, Mr. Gniel's Mallee farm, of eight years' standing, has not yet been sheep-proofed.

No one doubts the general truth of the statement that the maximum profits cannot be made on the average wheat farm without the aid of sheep, but it is of interest to note that that is not necessarily the case, because, for instance, Mr. Muller's labour income on a unit of capital was exceptionally high, while that of Mr. Gniel was the highest of all.

Mr. Walter E. Dahlenburg's fine Team engaged in Summer Fallowing. The Plough has Prong Mouldboard.

At this stage it should be made clear that farms differing so widely in size, objective, and natural scope of development could not be judged on one hard and fast standard. To be both fair and businesslike, each farm had to be compared, not so much with the next one, but with what it ought to be. For instance, Mr. Gniel's crop, which averaged 18 bushels to the acre—a record for a drought year in the Mallee district—was considered equally meritorious with that of, say, Mr. Lutze, with nearly double the yield, but in a much more favoured district.

Results.

The Winning Farm.

Mr. Walter E. Dahlenburg's "Ellerslie" farm of 840 acres was first with 222 points out of a possible 300. It is situated closed to the Salisbury railway station on a small black plain.

This farm, which won the district competition for small farms in 1913, set a very high standard in every branch. The homestead, the

attempts to improve the environment, subdivision, arrangement of buildings, water supply, &c., showed evidence of most careful planning; and, indeed, every department of the farm—rotation system, cultivation methods, bore the hallmark of sound and advanced knowledge; while all skilled work, from repairs executed in the blacksmith's shop to the complete set of farm accounts kept, showed evidence of a technical ability of the very highest class. The income on the unit of capital employed, after allowing for interest on capital, was substantial, though not as high as that of a few of the other competitors.

Perhaps the features of most general interest on this farm are the special provision that is made for autumn sheep feed by the sowing of large areas of stubble sown oats, the comprehensive water supply system installed, the live stock, and the method adopted in raising pigs. These features, together with the business activities, will be referred to later under appropriate headings.

The best Team of Horses in the Competition—that of Mr. T. E. Moller, Dimboola.

Mr. D. N. McLennan's farm "Banavie," Marnoo, secured second prize with 204 marks. This farm consists of 1,108 acres, 480 acres being rented. It is exceptionally strong in the provision made for water supply in the live stock, and one possessing an attractive farm home. The weakest points were the rotation system, and character and arrangement of farm buildings.

Mr. P. Muller's farm was third on the list. All-round excellence was shown, but there were no sheep. Mr. Muller having achieved some reputation as a horse breeder, concentrated his attention in the past on raising young horses instead of sheep. He is now going into sheep. As previously remarked, the profit on this farm showed a high return on the capital investment. There were substantial fodder reserves.

Mr. R. C. F. Gniel, of Walpeup, was next with 197 marks. The notable return on the small capital outlay made on this farm is evidence of the suitability of the New Mallee for sound farmers with limited capital. Mr. Gniel won the Ouyen farm competition this year. There is an attractively situated home, and the farm buildings, though not so substantial as most of those exhibited, are nevertheless laid out more attractively and to greater advantage than those of any other competitor. Water supply, fodder reserves, and cropping methods were excellent.

The main weakness was absence of sheep-proof fences and sheep. Considering that this farm was virgin Mallee eight years ago, its condition to-day is worthy of special commendation.

Mr. Lutze's farm is one of those which gives a high return on the capital outlay. A special rotation system is adopted, and there is a fine new stable and an up-to-date labour-saving device for loading hay at the stacks and trucking it on rails to the cutter. The main weakness was unattractive environment about the home and scattered arrangement of farm buildings.

Mr. R. Blackwood's farm of 1,484 acres is chiefly notable for the excellent cropping system practised, for a splendid kit of farm implements, and for some very effective new farm buildings. Though the aggregate profit on the farm was high, the net "labour income" per unit of capital outlay was lower than that of some of the smaller farms. This is a disability which is inherent in any large farm in the Wimmera at present prices of land.

Mr. Paul Muller's Colt.

On Messrs. Robertson and Block's properties, sheep are the main consideration. Mr. Robertson had the best sheep and the most up-to-date residence of all of the competitors.

Mr. Block's farm had an attractive residence with the best orchard and vegetable garden shown. A special feature is the rotation system practised for grass improvement, and much technical ability was displayed in construction of farm gates, repairs to implements, &c.

Mr. Reichelt's farm has not been developed so far yet as some of the others, and he is cropping a relatively small portion of his 1,500-acre block—hence the return on the capital, though adequate, was rather lower than usual.

Mr. T. E. Moller has a fine residence and excellent horses. The labour income was rather low.

TABLE SHOWING SCALE OF POINTS AND DETAILS OF MARKS AWARDED.

Name.	Best Method of Cropping, Rotation, and Methods of Cultivation.	Character, Condition, and Value of Farm Crop.	Fallow.	Horses.	Sheep.	Cattle.	Pigs.	Poultry.	Machinery and Equipment.	Character and Arrangement of Farm Buildings.	Water Storage.	Fences, Gates, &c.	Orchard and Vegetable Garden.	Fodder Reserves.	Trees for Shelter.	Insurance.	Home.	Total.	Business.	Grand Total.
Points	25	25	10	15	10	5	5	5	15	10	25	10	5	25	5	5	25	225	75	300
W. Dahlenburg	21	17	9	11	6	5	5	4	14	9	23	9	4	16	4	3	18	178	44	222
D. N. McLennan	14	24	7	9	9	3	0	4	11	4	23	4	3	15	4	3	22	159	45	204
P. Muller	18	20	8	10	1	4	2	3	9	6	14	4	4	19	4	0	17	143	60	203
R. C. F. Gniel	17	22	4	7	0	2	0	3	12	8	13	1	2	17	4	3	15	130	67	197
A. A. Lutze	19	22	9	8	5	3	1	2	10	5	14	4	0	18	1	3	8	132	60	192
R. Blackwood	19	23	9	9	7	4	2	3	15	7	16	6	1	16	3	3	12	155	31	186
F. O. Robertson	10	18	4	6	10	2	1	3	10	4	16	4	3	20	3	2	25	141	44	185
C. D. Block	17	16	6	8	9	3	1	2	12	7	15	3	5	18	3	3	20	148	34	182
C. Reichelt	15	21	7	8	5	4	2	2	8	5	10	4	1	12	2	3	7	116	26	142
T. E. Moller	12	15	7	14	5	4	2	3	9	4	13	4	2	8	3	4	21	130	10	140

Cropping Systems Adopted.

The more important objects of a proper rotation system include the maintenance of soil fertility unimpaired, the prevention of the spread of plant diseases, the economical distribution of labour over the year, and the multiplication of the avenues from which the farm revenue is derived. No rotation system, however desirable from these points of view, is feasible unless it will pay its way. For instance, on a new Mallee farm such as that of Mr. Gniel, the objects named are subordinate to the financing of the proportion during developmental stages and to the necessity for the subjugation of the ubiquitous Mallee shoot.

But there comes a time in the Mallee, however, when it is possible to adopt a system of farming which provides for fallow, the resting of the land and the introduction of sheep. This means a reduction of the

Another View of Mr. T. E. Moller's Eight-horse Team.

area under wheat, but is accompanied by higher yields per acre, decreased cost of production, less risk from drought and enhanced profits.

Many of the farmers in the newer Mallee cannot wean themselves from the methods which are essential during the first few years of settlement, but Mr. Gniel has done so and reaped his reward. He was able to sow one-third of his crop on fallow four years after settlement and during the past two years has sowed 90 per cent. of the crop in that way. Last year 170 acres of crop sown on well-worked fallow averaged 18 bushels per acre—the average of the district being about 6 or 7 bushels.

In the Wimmera the pioneering stage has been long passed, and on the wheat farm the rotation system adopted is of the highest importance in determining the crop yields, the stock carrying capacity, and, ultimately, the profit per acre.

The cropping sequence—fallow, wheat, oats, pasture—has been dignified with the term the "Wimmera Rotation," but a systematic investigation of some hundreds of Wimmera farms during the past few years has shown that not 1 per cent. of the farmers in the Wimmera apply it strictly to every paddock on their farms. On an average farm of 640 acres the following is a fair sample of the allocation of the land:—190 acres fallow, 190 acres wheat, 70 acres oats for hay and grain, 200 acres of natural pasture. Under this system some of the paddocks on the farm are not sown to oats after wheat, but are left lie in pasture. On larger farms the proportion of land under natural grass is greatly increased.

Some of the competitors have adopted interesting modifications of the popular practice.

Mr. Walter Dahlenburg is one of these who conform most closely to the theoretic standard mentioned. On his 840 acre farm there are usually 250 acres of fallow, 250 acres of wheat, 200 acres of oats for hay, grass, and sheep feed, and the balance 140 acres is in grass; thus 83 per cent. of this farm is under cultivation in any one year—a very high proportion.

Mr. Dahlenburg's reason for increasing the normal acreage sown to oats is that he recognises that the natural pasture in the Wimmera does not give anything like the return that might be obtained by cultivation. He has tried to improve the pasture by sowing 1 lb. of melilotus with the cereal crop preceding the resting of the land, but finds the sowing of oats on the stubble much preferable.

Last year Wimmera rye grass was tried on some stubbles with such satisfactory results that the whole of the resting land may be sown with it next year if seed is available.

Mr. Dahlenburg says that he can maintain twice as many sheep on the oats as on the natural grass. In the good years some of the oats is allowed to mature and is stripped, but in ordinary years it is entirely sacrificed to the sheep.

On this farm 300 sheep are maintained, and half of them can be lambed down.

Messrs. Crouch Brothers, of Kaniva, adopt a similar practice of sowing oats especially for sheep feed. The stubbles are burnt, and 30 lbs. of oats drilled on the stubbles without manure. The carrying capacity of the paddock is said to have been doubled.

Mr. Blackwood is one of those who has begun to pay attention to improving the carrying capacity of his resting lands. Last year he sowed Wimmera rye grass at the rate of ½ lb. to the acre with the wheat on a paddock about to be spelled.

Mr. A. A. Lutze is the exponent of a most interesting system of farming black land. It might be termed the "crop and spell" system. Instead of any one paddock being cropped once with wheat and then oats or rested in grass, Mr. Lutze's practice is to sow it to wheat after fallow three or four times in succession before sowing it to oats or resting it in grass, but when in grass it is resting for a correspondingly long period. It is admitted that the grazing value of the paddock in grass steadily diminishes throughout the period, but it is claimed that far better yields of wheat are obtained. In the opinion of Mr. Lutze, the black soil may by this method be got into a condition of tilth resembling

an onion bed and kept quite free from wild oats. It is of interest to note that Mr. Lutze's wheat yields are of exceptionally high order, having averaged no less than 36 bushels per acre for the last five years over an average area of 267 acres cropped. During the past fifteen years an average of 242 acres of wheat have been harvested for an average yield of 26 bushels per acre. There has been a steady increase in yield per acre right throughout the period. Mr. Lutze's returns from sheep are not so high as those of Mr. Dahlenburg, and it is difficult to say what would have been the effect on the wheat yield had more oats for sheep been grown. It should be remembered that the soil on Mr. Lutze's farm is very fertile. The net returns were higher than those of Mr. Dahlenburg.

On the two large farms, those of Messrs. C. D. Block and F. O. Robertson, at Goroke, the cultivation is subsidiary to the production of wool. Cereal crops are, however, grown on shares, and the great benefit to the grass which follows the cultivation when the land is spelled is noticed.

Mr. Block furnishes the following concrete instance. Before cultivation, one paddock of 400 acres used to carry from 150 to 170 sheep the year round. Since cultivation, 250 sheep are carried, and they cut 2 to 3 lbs. more wool per sheep. Similar instances are furnished by Mr. Robertson, whose property two years ago consisted of 3,000 acres, on which 600 acres, including fallow, were cultivated annually; on the remaining 2,400 acres, with the help of the stubbles, 1,600 sheep were carried. Since then, the size of the property has been increased to 4,000 acres, and the area cultivated to 1,400 acres. Now the area under grass is 2,600 acres, and 1,500 lambing ewes, and 800 dry sheep can be kept. That is, although the area of grass only increased 200 acres, 700 more sheep can be maintained.

It was also authoritatively stated that, on a very large property in the vicinity, although one-sixth of the land is now being cultivated and not available to sheep for six months of the year, more sheep can be kept than when there was no cultivation, and that the wool clip is bigger.

At Goroke the manure and the cultivation induce a heavier and sweeter growth of grass, and the young crop and the stubble furnish useful feed.

Crops and Fallows.

The fallows, the farm crops, and the methods employed in growing them, have been fully treated in the reports of the district competitions made to the local agricultural societies, and already published in the *Journal of Agriculture*.

Live Stock.

Horses.—As the Wimmera is famous for its draught horses, it goes without saying that those exhibited were, on the whole, of a superior stamp.

Up to the present, the farm tractor has not in Victoria seriously challenged the horse as the motive power for farm implements. The wheat farmer still depends on the horse to bear the brunt of the work and rapidly drag his labour-saving implements across the broad acres.

It is of the highest importance, therefore, that the breeding of a race of staunch, free-moving, draught animals should not be neglected.

The prevailing low prices for horses has, however, discouraged many breeders, so that there are fewer foals this year, but most of the farms are overstocked with young horses; these, and some of the brood mares, though generally of excellent quality, were too poor in condition to show up to best advantage.

Since the effectiveness of working teams depends largely on condition and freedom from defects, such as sore shoulders, points were heavily deducted where these and similar defects were noticed. Mr. T. E. Moller had the best all round farm horses; Mr. Dahlenburg's were next; Mr. Muller's were of splendid quality, but lacked condition.

Mr. F. O. Robertson's Merinos in the Wheat Stubbles at Goroke.

Sheep.—Sheep make better use of waste roughage that is found on the wheat farm than any other animal. They keep the fallows clean, and they do not require much supervision, except at the slack periods of the farm year. Some farmers go so far as to say that wheat cannot be profitably grown without sheep, but that is not true in every case. Two have been quoted in this report—one where the breeding of high-class horses has taken their place, and the other is that of the new Mallee farm not yet out of the pioneering stages.

During the first few years of Mallee settlement, there is a good deal of coarse roughage more adapted to cattle and horses than sheep, but thereafter, as soon as the capital for sheep-proof fences can be found, sheep will enhance the profits.

The rapid rise of prices for wool since the war has had its effect on the class of sheep bred on Wimmera farms. There is a strong tendency even among the smaller farmers to breed towards the merino from large-framed sheep with fine wood, such as the comeback, rather than from the crossbred towards the Lincoln for a "freezer."

Messrs. Robertson, Block, and McLennan are breeding pure merinoes. Mr. Blackwood has the New Zealand Corriedales, while Messrs. Lutze and Dahlenburg have crossbreds.

Mr. Robertson's sheep are a particularly good lot. They comprise an even line of 1,500 6-tooth breeding ewes, 800 weaners, and 25 Mortat rams. They were in good condition. The top line of wool from these sheep last year realized 28d. Mr. Robertson does not deal in sheep. His system is to cull over the young sheep as 4-tooths before putting them to the ram. The wethers are sold, as are the five year-old ewes. The culling takes place before shearing to the extent of 30 per cent.—size, quality, constitution, and absence of wrinkles are regarded as essential.

Mr. Block's sheep are of Tasmanian strain. They were being hand-fed with hay. Mr. McLennan has a number of merino ewes of good quality derived from "Rich Avon" and Lannan Kaniva. South Australian rams from Nalpur are being tried with these. It is proposed to develop a stud.

Mr. Blackwood started some years ago with station-bred merino ewes. New Zealand Corriedale rams were joined with these. Fresh Corriedale rams were then joined with the female progeny of these, giving three-quarter bred Corriedales — a big-framed sheep. Mr. Blackwood claims that if the wool gets coarse he can come back on to the merino and still maintain a large frame.

Mr. Dahlenburg's system is now not to replace the ewes in one line, but to breed and cull. At present, a fine-woolled comeback is being bred for the grazier. When bred too fine, a Lincoln ram will be joined and a freezer bred.

Mr. Lutze's practice is to buy a line of crossbreds and join them with Lincoln rams, with the object of producing a freezer. Ultimately, the ewes are replaced by a fresh line.

Other Live Stock.

Cattle.—On the smaller wheat farms, especially in the newer mallee settlements, the number of dairy cattle kept is rather surprising. Frequently half-a-dozen cows are milked, the regular weekly returns from these and the poultry being largely depended upon to liquidate the store bills.

Mr. Dahlenburg's cattle comprise 2 red-polled heifers, 1 two-year-old red-polled bull. There are also 3 grade milkers. These red-polled cattle were in good condition, and the breed makes an ideal dual-purpose animal suited to the requirements of the northern wheat-farmer. He was easily strongest in this department.

Pigs.—The wheat farms where pig-raising is made a commercial proposition are relatively few, chiefly on account of the alleged drudgery involved. But this can be largely diminished by allowing the pigs to graze on green crops for portion of their feed, and by provision of handy means of watering them and giving balance of feed.

Mr. Dahlenburg has 4 breeding sows, including 3 pure-bred Middle Yorks. The boar is a pedigreed Middle York from Longerenong. At the time of the visit, in addition to these, there were 14 baconers, 14 stores, and 15 suckers—all an even line of white colour. The

Middle Yorks do not scald in the sun like the Large Yorks. The following system is practised—stores and sows with litters are placed on green barley in May to graze. They receive pollard in addition. Later, they are closed up and fed on pollard and mixed grains. Baconers are ready in eight months. Mr. Dahlenburg has calculated that the net profit for the time devoted by him to pigs is £1 per week, in addition to which market rates are obtained for all produce fed. The sties are excellent ones, and feeding and watering convenient.

None of the other competitors had more than one or two pigs—and these were kept for household use.

Mr. Geo. Batson, of Nhill, is another wheat farmer who makes a special department of pigs. He prefers the Berkshire breed, and in addition to barley forage, sows peas. The peas furnish feed when the barley is finished.

Mr. Robert Blackwood's new Dome-roofed Iron Stables at Kiata East.

Buildings, Machinery Equipment.

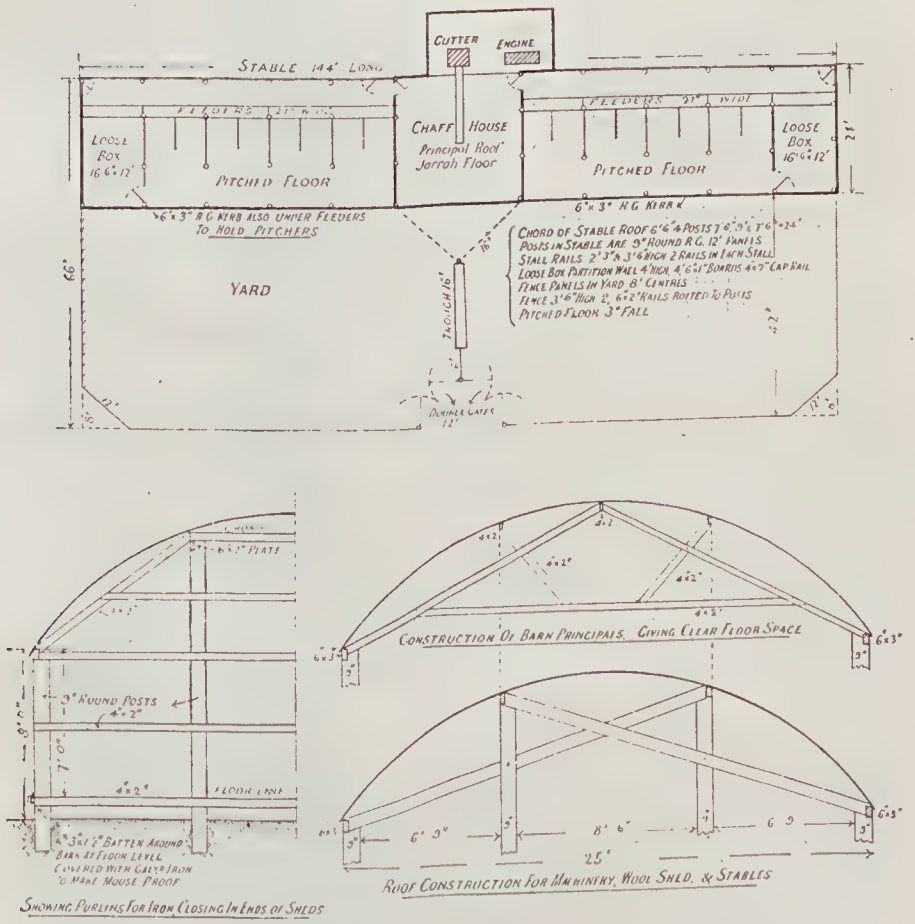
Buildings.—The farm buildings on many Victorian wheat farms are more often than not merely a scattered collection of tumble-down bush sheds. They conform to no settled plan, and neither in design nor arrangement are they suited to modern requirements.

There is no valid excuse for the dilapidated structures which, having served their purpose in the pioneering days, still mar the landscape throughout the wheat belt, and there is need for a widespread propaganda designed to encourage their replacement by more up-to-date structures.

The costliness of an elaborate group of farm buildings is not necessarily evidence of their effectiveness; neither is the obvious cheapness of a few straw "lean-to" structures a certain recommendation of their suitability. Straw-roofed sheds have the advantage of being cheap and cool in summer. Iron is more permanent, and when properly ventilated, may be made equally cool, and the fire danger is less.

The most important requirements of farm buildings on a wheat farm are, briefly:—

1. Effective feeding and stabling of each working horse.
2. Efficient handling of hay from stack to cutter, and thence to store and horse.
3. Protection from weather, animals, birds, and vermin, of implements liable to deterioration.
4. Provision for rapid repairs to implements.
5. Provision for catchment and storage of roof water.
6. Ventilation and coolness in summer.
7. Moderate cost and durability.


CUTTER
ENGINE
STABLE 144' LONG
CHAFF HOUSE
Principal Roof
Jarrah Floor
LOOSE BOX 16'6"x12'
PITCHED FLOOR
LOOSE BOX 16'6"x12'
YARD
6"x3" R.G. KERB ALSO UNDER FEEDERS TO HOLD PITCHERS
6"x3" H.G. KERB
CHORD OF STABLE ROOF 6'6" & POSTS 7'6" 9'6" 7'6" = 24'
POSTS IN STABLE ARE 9" ROUND R.G. 12' PANELS
STALL RAILS 2"3" & 3'6" HIGH 2 RAILS IN EACH STALL
LOOSE BOX PARTITION WALL 4" HIGH, 4'6" & 1" BOARDS 4x3" CAP RAIL
FENCE PANELS IN YARD 8' CENTRES
FENCE 3'6" HIGH 2, 6"x2" RAILS BOLTED TO POSTS
PITCHED FLOOR 3" FALL
DOUBLE GATES
66'
24'
42'

Plan of Mr. Blackwood's new Stable, showing Method of Construction.

These requirements cannot be satisfied unless each building has a very definite design, and its position is closely correlated with every other, and with water and fodder reserves.

The relation of the site of these buildings to the homestead and the farm as a whole should be such that good drainage and aspect are secured, and that there is easy access to roads and farm paddocks.

These general principles may be best illustrated by the consideration of concrete examples.

Mr. Dahlenburg's farm buildings, and their disposition and relation to the rest of the farm, most nearly satisfied these requirements.

Mr. Gniel's improvements, though not of such a permanent character, were nevertheless exceedingly well arranged, and eminently suited to the requirements of a Mallee farm.

Mr. Blackwood, who took over his property in 1914, "inherited" a number of tumble-down structures, which he is now replacing with some buildings of an exceptionally useful type. Other competitors had features of interest.

Mr. Dahlenburg's buildings were of galvanized iron, and of the "dome-roofed" type—probably the simplest iron in buildings in use on farms. They consist of a 10-horse stable and loose-box, 21 feet x 68 feet; barn, 45 feet x 13 feet; engine-shed and chaff-house, 13 feet x 38 feet; and chaff store, 21 feet x 24 feet, all under one roof, and all substantially floored. Implement shed, 45 feet x 25 feet, with walls 10 feet, and 10 feet to top of dome. Two sections of this shed have doors on both sides, so that waggon, &c., need not be backed in.

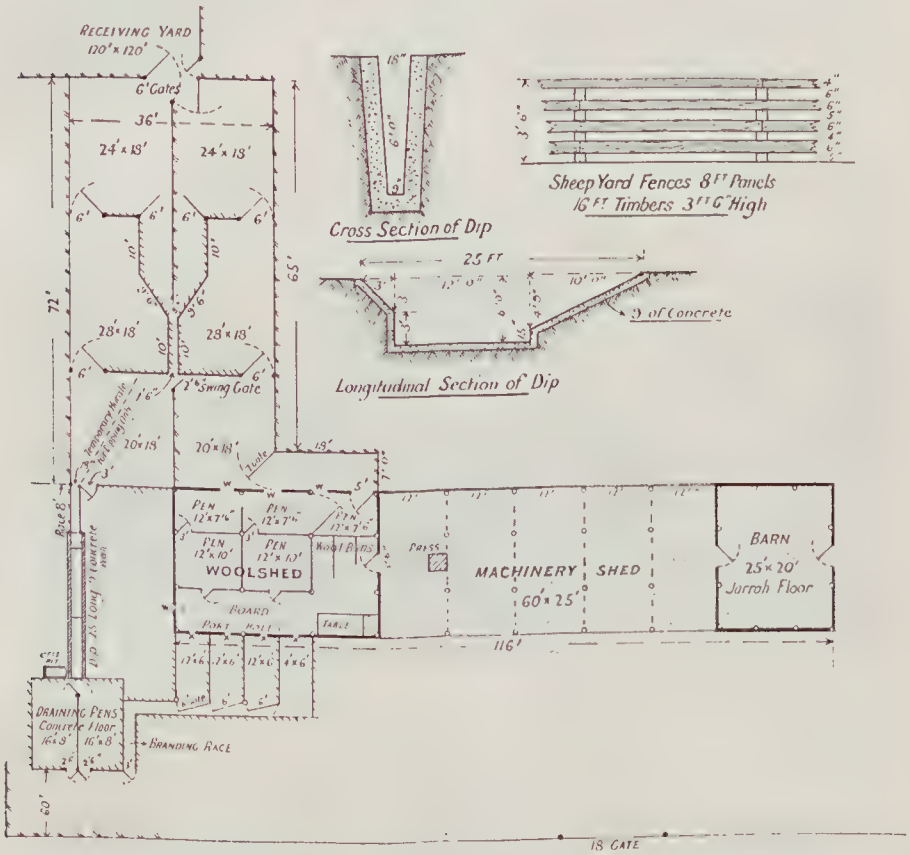
Mr. Robert Blackwood's Barn (on the right), Implement Shed, and Woolshed. (Note the method of mouse-proofing the barn.)

There is a substantial iron pigsty, with six raised pens, and central feed alley, and there is a loading chute and handy pig-proof yards. Sheep yards and special horse dip are provided; the whole are situated at centre of gravity of the farm at corner of two roads. Easy access is also commanded to cultivation and grass paddocks, water supply, and stockyard. The arrangement may better be seen from the plan.

Mr. Gniel's buildings were described in *Journal of Agriculture*, page 71, December, 1919. They are iron-roofed, with walls of neatly dressed poles of native pine, and are grouped round the three sides of a well-grassed square, and neatly aligned.

Mr. Blackwood's improvements are notable for a fine new four-roomed worker's cottage for married couple, a substantial sixteen-horse stable and chaff-house—dome-roofed type—and in addition there is a new barn, implement-shed and woolshed under one roof.

In the stable the horses are disposed side by side in single stalls. Protected iron feeders, 3 ft. 6 in. high, are provided. The chaff-house



Plan of Mr. Robert Blackwood's Barn, Implement Shed, Wool-shed and Sheep Yard.

is on the ground level, and well floored with jarrah. The pitching under the horses is squared Stawell freestone, which cost about £3 per horse. The stable is open towards the east.

Implement-shed, 25 feet x 60 feet; barn, 20 feet x 25 feet; and woolshed, 40 feet x 25 feet, are covered with dome-iron roof. The implement-shed is open back and front, but the building faces east and west, so that a minimum of direct sun enters.

The barn is provided with a jarrah floor, and is specially protected against vermin in the following manner. The floor is raised 15 inches above the ground, and the corrugated iron walls led flush on to the ground plate, which projects 1½ inches, and is sheated with plain iron.

The wool-shed and yards are excellent. Concrete dip and draining pen are provided, the dip being 24 feet long, 6 feet deep, and 18 inches at top, tapering to 9 inches in bottom.

Mr. Lutze's new eighteen-horse stable of wood and iron, 70 feet x 36 ft. 9 in., walls 12 ft. 6 in., gable 23 ft. 6 in., was very effective; it cost £300. Special attention has been paid to the economical handling of the feed. The horses are placed head to head with central feed alley between, the paving being with railway sleepers.

By means of a trolley which runs on iron rails, a 5-ton load of hay, i.e., enough to last half a day's cutting, may be pushed by hand from stacks into the end of the stable, where it can be cut under cover and elevated to the loft, which holds 30 tons—sufficient to last the horses about three months. Stops at busy periods of the year to cut chaff are thus avoided. Oats and chaff are made available in the feed alleys through chute.

Mr. T. E. Moller's well-established Iron Stable at Dimboola.

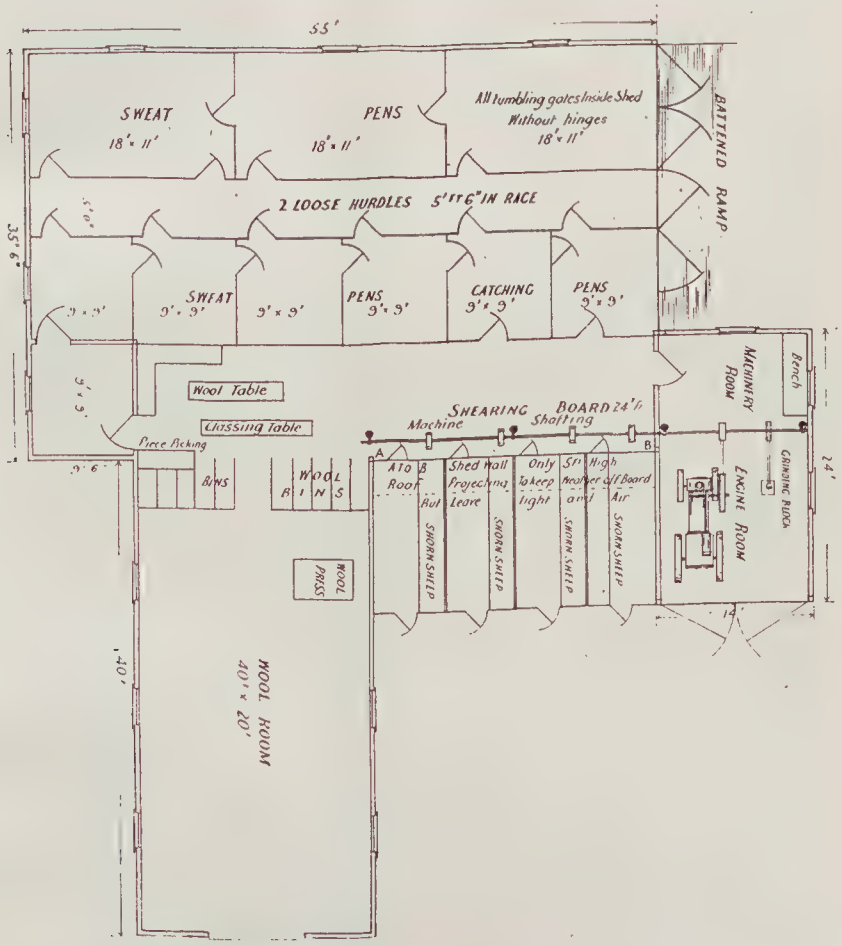
Subdivision—Shelter Belts.

The site of the homestead, and the arrangement of farm buildings, have already been discussed. In planning the erection of subdivisional fences, it is necessary to provide for the easy accessibility of the paddocks to water, to the farmyard, and also for a number of paddocks of dimensions suitable to the rotation practised. Usually, it is desirable, if possible, to have a group of large cultivation paddocks, each of similar area, and another group of somewhat smaller paddocks each of the same size. Several small paddocks for forage, &c., about the farmyard are required also. In addition, any plan should allow for future development being made without extensive scrapping of existing structures.

Where paddocks do not abut the farmyard, it is preferable to construct a lane or race to them, rather than enter each paddock from the other. If this be done, accessibility to paddocks, and movements of stock between paddocks to water is greatly facilitated.

The cultivation paddocks should, as far as possible, be rectangular, and about one and a half times as long as they are broad, and in groups of similar dimensions. Unless there are sufficient paddocks of similar area, it will be difficult to work the farm on a satisfactory rotation system.

Shelter belts should be left or planted, preferably in corners or near fence lines. Often it is possible, as Mr. Dahlenburg has done, to provide at the end of the lane a small square planted with sugar gums, giving

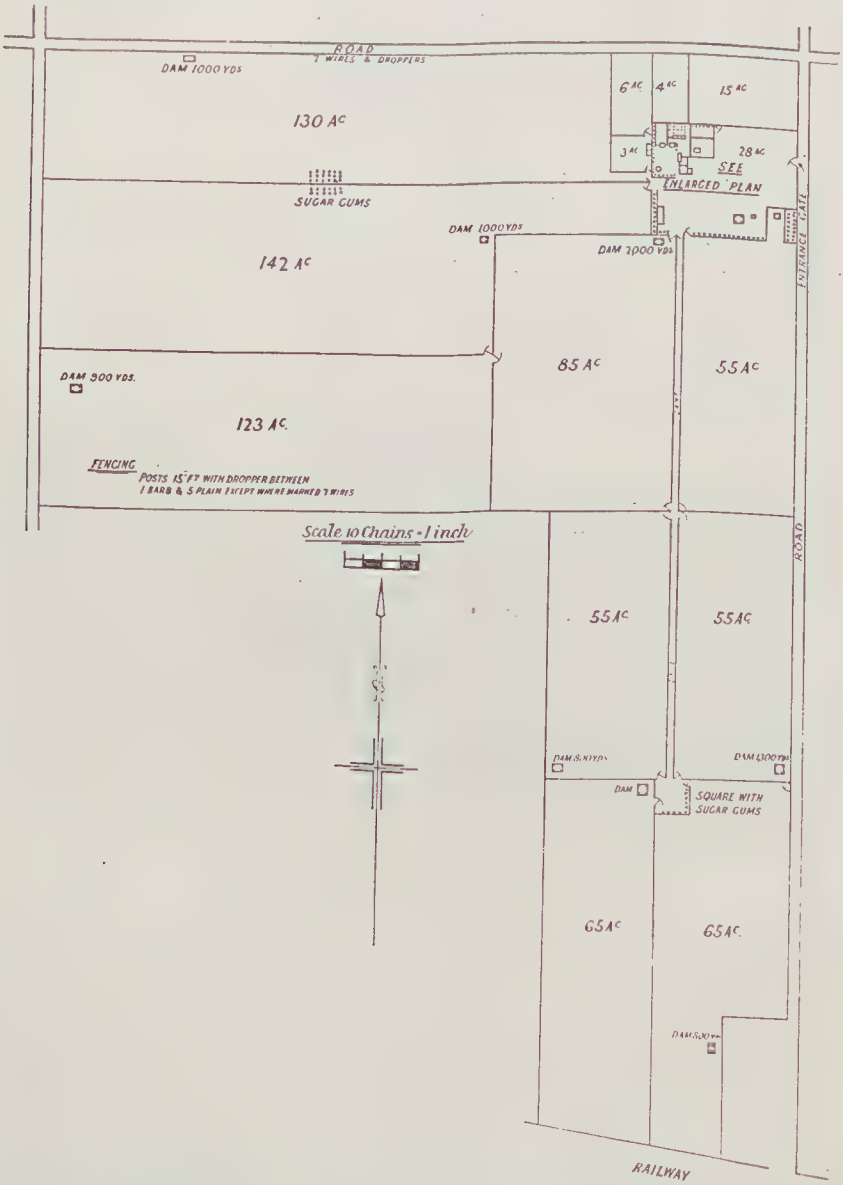


Plan of Mr. F. O. Robertson's up-to-date Wool-shed.

access to several paddocks. This may be made a useful place for feeding and watering teams, or the stacking of reserve fodder.

Messrs. Blackwood and Dahlenburg had the best fencing. Mr. Dahlenburg's gates are worthy of notice. There are 21 wooden gates of sawn timber, painted white, and carefully hung. Special chocks are provided to ease the strain off the hinges when the gate is either open or closed. The fastening is a slotted stick with a downward cant,

which slips into a hole in the strainer. The construction is as follows:—There are three uprights, each of two pieces of 3-in. x 1-in. hardwood bolted together, and five cross rails 3 in. x 1½ in., with barb on top. The two stays are 3 in. x 1 in.



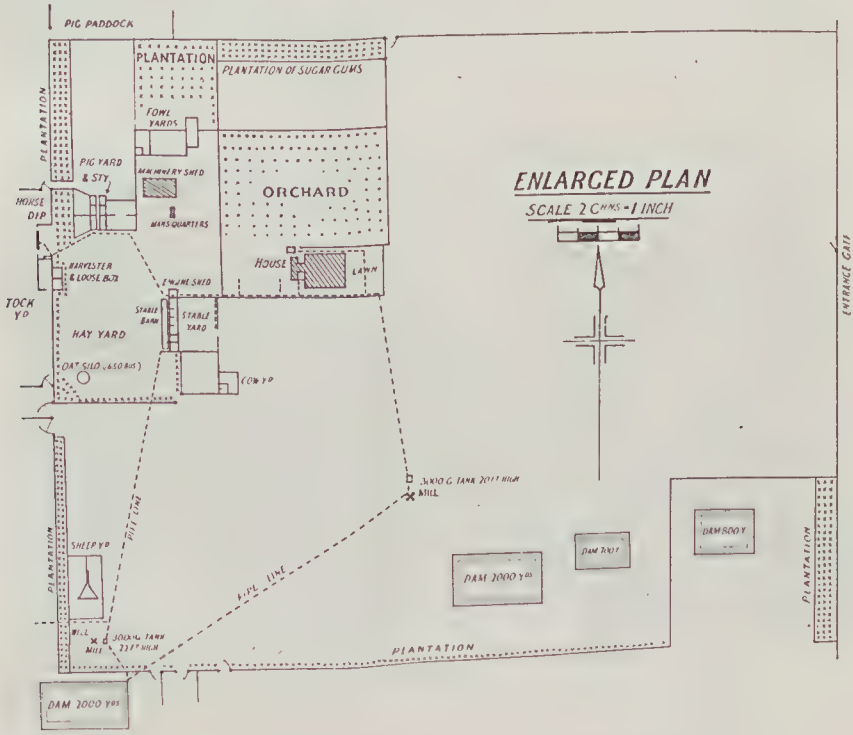
Plan of the Winning Farm—that of Mr. Walter E. Dahlenburg at Salisbury.

Mr. Blackwood has 5¼ miles of new fencing, but the remainder is old. There are nine 18-ft. double gates of iron—one side of the gate is 12 feet, the other 6 feet.

Machinery.

The capital devoted to machinery on the average wheat farm is considerable. At a normal second-hand valuation, the value of machinery on the various farms ranged from £500 to £1,400. The percentage of capital invested in machinery ranged from 4 per cent. to 15 per cent. of the total investment. The smaller figure was for a farm situated on a large area of high priced land, and the larger for the mallee farm. Whatever else he may lack, the average wheat farmer endeavours to have up-to-date plant and implements.

In awarding points for general efficiency of farm equipment, the suitability of the plant and implements for the size of the farm, the



Plan of the Homestead and Buildings of Mr. Dahlenburg's Farm.

completeness and condition of same, as well as the facilities for rapid repairs, were taken into account.

Mr. Blackwood's plant, though not quite so complete in some details as Mr. Dahlenburg's, was nevertheless strong in cultivating and harvesting implements, as befitting the large area cultivated. Most of the plant was not more than a few years old, and in excellent order. The harvesting implements comprised two headers and an 8-ft. binder. There was also a splendid new, locally-built waggon, with 3-in. axles, and 5-in tyres.

Mr. Dahlenburg's kit included, in addition to the regular machinery, grader, corn-crusher, home-made stack elevator, saw-bench, pickler, share in small threshing machine and combined drill cultivator. There

was also a good all round set of duplicates, kit of tools, and evidence of these having been used.

Mr. Block had a good set of machinery, including a powerful sawing plant, with which he can turn out the sawn timber required for buildings, &c.

Water Supply—Garden.

Those in the moister parts of the State sometimes find it difficult to realize the fundamental importance of an adequate and well-distributed water supply for the economical management, and for the improvement of the environment of the northern wheat farm. On it even depends the personal comfort of the inhabitants. Too much dependence in the past has been placed on mere pot-holes of about 1,000 cubic yards or so for the main supply. This inevitably means water carting in a dry year, with consequent disorganization of the farm

Good Type of Gate adopted by Mr. Dahlenburg.

routine. It also means bare, desolate surroundings for the home and the sparing use of water even for domestic purposes.

In the absence of an underground supply from deep well or bore, the house dam should be at least four times the figure mentioned. The "spoil" should be placed round the banks, and stock not allowed access. Settling pits and chute should be provided for water entering the dam. If this be done water for a quarter of an acre of garden and orchard, for bath and shower purposes, and, if necessary, for watering stock, &c., will be available. If this can be supplemented by a well or bore, or if water is obtainable from the State stock and domestic supply system, safety is assured.

As underground water is usually mineralized, it is as well not to apply this to the garden unless the dam gives out and no other supply is available.

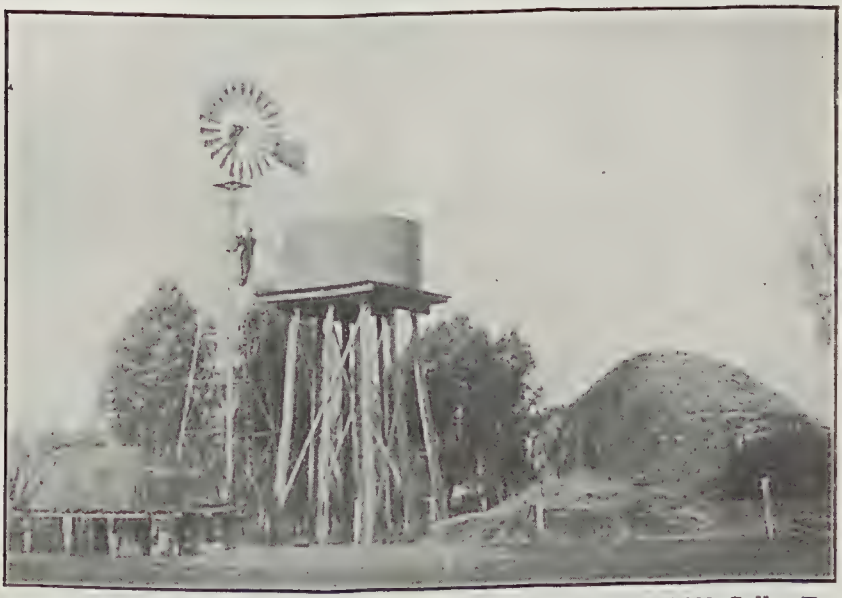
Every paddock should have access to a dam—nothing less than 1,000 yards is of any real use. They must be kept clean, and flushed.

Messrs. Dahlenburg and McLennan have each made excellent provision for water supply. That of each of Messrs. Block, Robertson, and Blackwood was also good.

The plan shows details of the complete scheme installed by Mr. Dahlenburg.

The main sources of supply are—a well, 4 feet by 2 ft. 3 in., and 160 feet deep, provided with 30-ft. mill and 3,000-gallon tank, on 20-ft. stand; 2,000-yard dam for overflow, and 2,000-yard dam for house, with 30-ft. mill and 3,000-gallon tank. These systems are connected with piping to each other and to house, garden, stable, hay-yard and cutter, pig-sty, sheep-dip, and horse troughs—in all, 2,000 feet of galvanized piping is used.

The well is timbered with red gum, and is provided with "chamber" and "box." The 14-ft. wheel of the well actuates a 3½-in. pump. This well will deliver 700 gallons per hour, as it was sunk until it was



Water Supply at Mr. D. N. McLennan's, Marnoo. (40-foot Tower, 5,000 Gallon Tank.)

impossible to keep the water down with an oil-engine delivering that quantity.

In addition, each paddock is provided with 1,000-yard dam. All were clean.

Mr. McLennan depends on a splendid house dam 4,000 yards, with mill, 40-ft. tower, and 5,000-gallon tank, and a new well 50 feet deep, close to house. Water is piped to house, garden, stables, and to various yards and troughs from the dam. The outlying paddocks are well provided with water in six dams, totalling 10,000 yards, three of which are 2,800, 2,300, and 2,200 cubic yards respectively.

Mr. Blackwood's house and farm-yard supply is dependent on a 2,500-yard dam, with mill and tank—dry at time of inspection. A splendid well, 116 feet deep, waters four paddocks. Plans and specifications of this well will be published in the next issue of this *Journal*.

Mr. F. O. Robertson's house and farm-yard supply depends on a well 90 feet deep, and a bore down 100 feet. A mill on this, with 60-ft.

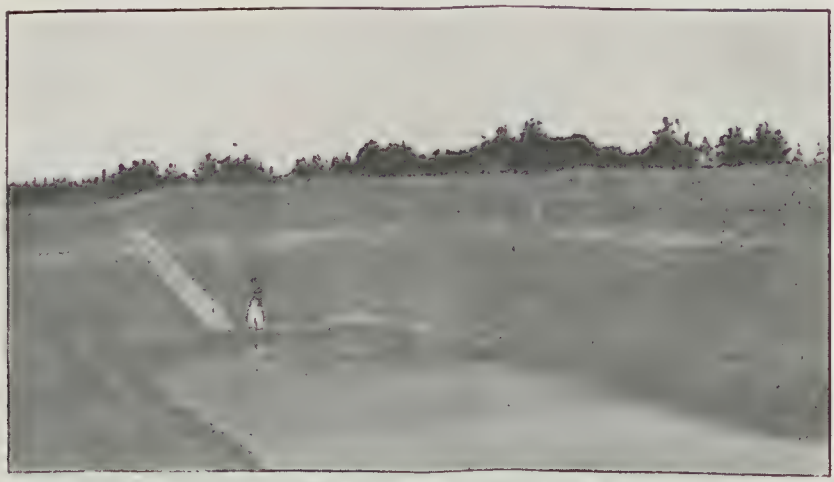
tower and 12-ft. wheel, supplies 11,000-gallon tank with 20-ft stand. Water is piped to garden, house, stables, and trough.

A feature of interest is a new log tank, 25 feet x 16 feet, and 13 feet deep, being constructed to hold 30,000 gallons. This is slabbed with native pine planks, and has a layer of sand at back to keep water clean, and has a cement bottom.

The supply to large paddocks is from lagoons, bores, and dams.

Fodder Reserves.

It is not sound business practice to take the risk of having to buy fodder at three times its normal price for stock in a drought year. At least a year's supply of fodder for horses, *i.e.*, 5 tons of hay, or its equivalent, per horse, should be maintained. Provision, preferably of oats, should also be made for sheep. The wise farmer, where he can afford it, surrounds his stacks with plain iron enclosures, and can defy the mice.



Mr. R. C. F. Gniel's New 3320-yard Dam at Walpeup. (Note concrete chute.)

Rectangular buildings of iron, with concrete floors and bush posts, can be cheaply constructed for the storage of oats. The appreciation in value of oats stored in times of plenty will pay for the building over and over again. The circular tank silos commonly used are liable to crumple under pressure unless specially stayed.

All competitors but one had adequate supplies of reserve fodder. Mr. F. O. Robertson, in addition to substantial supplies of hay, had 4,000 bushels of oats stored in an underground tank.

The Farm Home.

It has been recognised by economists that the difference between living conditions on the average farm and those available in a modern city, are responsible to some extent for the modern craze known as the drift to the city. In the city it is possible for the initial cost of quite a number of conveniences, such as transport, lighting, sanitary systems, to be capitalized, and then the utility made available at small cost to the consumer. In the country the farmer must provide them himself. So also in the city, amusements may be readily organized on a business basis. In short, the city man takes many of his comforts

and pleasures ready made—the country man must provide them himself or go without.

It does not necessarily follow that the environment in the country may not be vastly improved, but if that is to be done, it is obvious that the rural population requires to be specially educated for the purpose,

Mr. A. A. Lutze's Stack and Stable, at Coromby, showing good Method of Handling Hay with Rails and Trolley. (Note the Mouse-proofed Stack.)

Close View of Mr. A. A. Lutze's Trolley for Shifting Hay from Stack to Cutter.

because it is called upon to perform functions not required of the average city man.

The average country home of the established farmer in the older wheat-belt stands in need of substantial improvements, both from a utilitarian and an æsthetic point of view. Many well-to-do farmers are

quite content for their wives and families to put up with easily remediable inconveniences that the humblest city dweller would not tolerate for a moment.

More shady verandahs and cool cellars are needed, and more convenient kitchens. Relatively cheap, modern lighting systems are obtainable which will banish the spluttering candle and the dangerous oil lamp. Piped water does away with heavy water carrying. Convenient wash-houses, with troughs and copper, should supersede the usual open-air makeshifts.

The telephone helps to conquer isolation, and the motor car can annihilate space. All these things are not urged for the struggling farmer, but he should recognise that they are possible ultimately on a well-managed wheat farm rather than that he and his children should learn to regard them as necessarily the adjuncts of the city and unattainable on the farm.

The most attractive Home in the Competition—that of Mr. F. O. Robertson "Pleasant Banks," Goroke—(material—lime concrete).

Again, there is nothing more attractive and homelike than a good garden. It means fresh fruit, fresh vegetables, bright flowers, and a cool lawn for the summer nights. The alternative is surroundings as parched and uninviting as the desert itself. The desert has been made to bloom like a rose on many a Wimmera farm, but there is room for improvement on a great many more.

That the spread of these ideas among farmers of improved living conditions can be readily fostered may be deduced from the fact that, in the Wimmera, most of the farms with good homes and gardens occur in isolated groups. This, on investigation, generally proves to be either the result of interest being focussed on the subject by some neighbourly rivalry, or is the fruit of some organized enterprise, such as a Farm Competition. The Nhill and Rupanyup districts are cases in point.

The best farm home in the competition was that of Mr. F. O. Robertson, of Pleasant Banks, Goroke. The house is built in the bungalow style, and is surrounded by a shady verandah 10 feet deep. It is replete with every modern convenience, including lighting, and sewerage system with septic tank, telephone, &c.

The material used for construction is termed locally "lime concrete." This is really a mixture of lime and a cementy buckshot soil obtained on the spot. It is stated that neither clean sand nor any loamy soil is of any use in making "lime and concrete." As buckshot soil similar in appearance to that used exists on almost every farm on the buckshot country in the Western Plains, and over other large

"Banavie," Residence of Mr. D. N. McLennan, Marnoo, Second Prize Farm.

Mr. Dahlenburg's well-cultivated Orchard.

areas throughout the State, its possibilities for building construction should be well worth investigation. It is stated that a first class building can be constructed with the material for about half the cost of wood at present prices.

The *modus operandi* is as follows:—A quantity of buckshot soil is placed in a large box, and slacked lime and water are poured in and mixed with it until it is said to be "spewy." *i.e.*, of such consistency that

it can just be retained on the shovel. It is then poured into the moulds —usually between 9-in. boards. Large lumps of limestone, &c., may be added to save material.

The corners are reinforced with broken bottles, old iron, haybands, and hoop-iron from woolpacks. Dummies are placed in position for the doorways, but the actual frames of the windows may be plugged into the walls and put in position during operations. The walls are then faced with a mixture of lime and sand. Concrete foundations are needed. The exact proportion of lime used could not be ascertained, but it is said to be very low.

The septic tank was merely a cement structure 12 feet x 8 feet x 8 feet, with an air-tight lid. The inlet pipe goes to the bottom, and the outlet comes from the top. It was effective.

Most of the other competitors had good homes and gardens—as illustrated.

Mr. F. O. Robertson's Lime Concrete Stable at Goroke.

The Farm as a Business.

Agriculture has been defined as an art, a science, and a business.

A farmer somewhat indifferently skilled in the art, and who prefers rule-of-thumb science, may conceivably do tolerably well financially provided the proposition is a good one, and that he has enough business acumen to keep expenditure below revenue. On the other hand, should he neglect to do that, not all the art or science in the world will save him ultimately from the Insolvency Court.

Business, then, is the yardstick by which all agricultural practices and agricultural science must be measured before they can be put into use on the farm.

Most farmers are required, for Federal income tax purposes, to have an annual investigation made of their farm business; but few are able to make use of the figures so obtained to detect faults in the management of the farm. These returns, if correlated with the farming methods used, are most instructive, and they become especially so when compared with the returns and methods of the best farms in the community. Each farm in the wheat-belt of Victoria is, in effect, an agri-

cultural experiment which has been in progress for a number of years, and its key is hidden away in a jumble of figures. Unravel the threads, and you have a concrete explanation of the success or failure of each farm in the State.

This competition has afforded the opportunity for a thorough investigation of a limited number of farms on these lines, and the results are so encouraging as to suggest the advisability of making a much wider inquiry into the subject.

Analyzing the Farm Business.

The average farmer in the Wimmera has a capital ranging from, say, £5,000 to £15,000 invested in his farm. The same money, if invested in some safe security where it would not entail supervision, would return him, say, 5 per cent. on the capital, and he would then be free to use his labour elsewhere. So that, unless the farm income is greater than 5 per cent. on the capital, the farmer is really working for nothing.

A Shady Corner of Mr. R. C. F. Gniel's Farm-yard at Walpeup.

The portion of the farm income which is attributable to the capital in its own right is called "capital income," and the portion over and above that and attributable to the effect of supervision may be called the "labour income."

Now, it is obvious that the relative size of this "labour income" is a reliable index of the skill of the farmer in managing his particular farm, and when it is compared with that derived from a large number of similar farms, it is possible to point with confidence to payable reforms that might be effected.

The method has been developed by the Office of Farm Management of the United States of America during recent years. Here whole districts of farms have been systematically surveyed, and certain farm business standards have been set up for each type of farm. A comparison of the returns from any farm with these readily shows up the weak spots, and they can be remedied. Farmers send in their returns in confidence, and receive a suggestive report in reply.

The experience there is that success on the farm primarily depends on:—

(1) The size of the business.
(2) The diversity of the business.
(3) The quality of the business.

i.e., just the same factors as underlie success in any commercial activity. A farmer instinctively knows these things, but the real difficulty is that he has no convenient way of measuring just how good or how poor is his business. To do this he must have a standard of comparison based on actual practical experience. He should, in other words, be able to compare his returns and methods with those of the best farmer in the community.

It is not, however, possible to do this unless a large number of actual farm businesses are carefully analyzed and a definite standard set up. To make such an analysis, a definite method is required.

The Method Used.

In the present competition, the difference between the revenue and the expenditure on each farm was obtained for each year over the period 1916-17, 1917-18, 1918-19, from copies of the Federal income tax returns, and the average annual profit determined.

A valuation of the capital investment was then made on the spot on the basis of strictly normal figures for three years ago, and 5 per cent. of this sum was calculated as the "capital income."

The difference between the average annual profit and the "capital income" was taken as the "labour income."

In determining the capital investment of each farm, the following were included:—

(1) Land and improvements.
(2) Plant and implements.
(3) Live stock.
(4) Average fodder reserves.
(5) Cash required to run business.

In determining the difference between expenditure and revenue, the following were included:—Revenue.—Wheat, hay, &c.; wool; hides; net increase in live stock; and net increase in fodder and supplies, sundries. Expenditure.—Wages and board, general expenses, depreciation, repairs, sundries.

Some Deductions from the Business Survey.

In publishing these, it has not been possible to include any matter which is likely to afford a clue to the identity of the competitor, and precautions have been taken to prevent the marks allotted for finance, together with the figures furnished herewith, being used for that purpose.

The survey of these ten farms disclosed the fact that, based on the returns for the three years 1917-1919, the whole of the competitors earned 5 per cent. per annum on their capital, and sums ranging from £60 to £820 a year in addition; but over a period of five years, commencing with and including the drought year 1914, the labour income (where the figures are available) was not nearly so great. One farm

did not quite make 5 per cent. on the capital over the period, but the best one earned £516, in addition to 5 per cent. on the capital.

It should be remembered that these are the figures from some of the leading farmers of each district, and that their average yields of wheat are much greater than the district average. For instance, if the competitors residing in the counties of Lowan and Borung are considered, it is found that their average yields of wheat over the past three years range from 22 to 33 bushels per acre, averaging 26 bushels per acre; but the district average for a similar period is only 19 bushels per acre.

Hence it is quite obvious that many farmers must be earning considerably less than bank interest rates on their capital, *which means that, instead of receiving payment for their labour and supervision, they are really paying for the privilege of working the farm.* In most cases, it is due to remediable faults which are detectable by a business survey.

Table showing Average "Labour Income" Derived during Past Three Years from Each of Four Leading Wheat Farms in the Wimmera, on Soil of Fairly Even Quality.

	A.	B.	C.	D.
Revenue—				
Wheat, hay, &c.	£2,044	£1,213	£1,897	£1,357
Wool	175	20	361	405
Net increase in live stock	334	202	115	197
Net increase in fodder	-2	-13	70	-37
Sundries	48	112	27	42
Total revenue	£2,599	£1,534	£2,470	£1,964
Expenditure—				
Wages and board	£405	£91	£579	£436
General expenses	392	167	311	483
Depreciation	53	36	100	51
Repairs	46	20	47	39
Sundries	203	39	164	195
Total expenditure	£1,099	£353	£1,201	£1,204
Income*	£1,500	£1,181	£1,269	£760
Five per cent. of capital	620	480	850	425
Labour income	£820	£701	£419	£335

* Interest on borrowed capital has not been deducted from income.

This table shows a considerable variation in the labour income received.

A and D are farmers, as nearly as possible, of the same area. The explanation of the difference in labour income is to be found in the fact that A cultivates an average of 40 acres of wheat more than D, and, further, that his yields have averaged no less than 7 bushels to the acre better during the three years. D goes in for more sheep, yet his expenses are greater than A.

B and C are another pair which form an interesting contrast. C's farm is more than twice as large as that of B, but instead of the labour income being greater on the larger farm, it is only about two-thirds of that of the smaller farm. The reasons lie in the following:—The large farmer is obliged to cultivate twice the area of wheat grown by the man with the smaller farm. Therefore, he cannot cultivate it so well—in fact, his average yields are about 6 bushels per acre less than B's.

C has to employ a good deal of hired labour, hence his expenses are higher. Instead of being twice as great as those of B, they are more than three times as great. Again, C has necessarily a much larger area in grass, and carrying only two-thirds of a sheep to the acre. On this he must pay a sum for interest on the capital out of all proportion to its sheep-carrying capacity. B's remedy is to endeavour to increase the carrying capacity of the idle land, and to increase, if possible, the efficiency of his farm labour.

The following general deductions may be drawn from the business survey. Whether they would hold when a much greater number of cases are considered, remains to be seen.

Summary of Deductions from the Business Survey.

1. The new Mallee farm gave the highest return on the capital and for the least investment.

2. The labour income from most of the farms where wheat is the mainstay was generally better than that from those where sheep were the main consideration.

3. In the Wimmera, the labour incomes from the high-priced fertile land were best.

4. The greatest factor in influencing the amount of the labour income on the farms considered was the average yield of wheat per acre. The most important methods used in securing this were:—
   (1) Thorough cultivation of fallow.
   (2) Liberal manuring of crop with superphosphate.
   (3) Care and attention to seed.
   (4) Adoption of a satisfactory rotation system.

5. The value of Wimmera land depends on the size of the farm. At present prices for wheat and wool, owners of 640-acre blocks well farmed can afford to give from £9 to £12, and even larger sums, per acre and still net a handsome return for their labour. On larger farms, it has not been possible to maintain the same percentage area under cultivation, nor the acreage yields per acre. A greater proportion of each of such farms is carrying sheep on the native grass. This means greatly diminished returns per acre without a corresponding decrease in the labour bill, and hence a poorer return on the investment.

6. The best farmers earn, in addition to 5 per cent. on their capital, considerable sums for their labour and supervision; but a great many have really to pay for the privilege of running the farm.

. . . . . .

I take the opportunity, in conclusion, to thank the various competitors for their hospitality, and for the thorough manner in which they answered questions and supplied material necessary.

TWENTY YEARS OF RECONSTITUTION.*

By F. de Castella, Government Viticulturist.

When I was honoured by being invited to read a paper before this, the first Inter-State Wine Congress held in Australia, it seemed to me that the most useful subject I could choose was that of reconstitution. Twenty years have elapsed since the first phylloxera-resistant stocks were planted at Rutherglen with a view to their subsequent grafting. Reconstitution is now an established fact in two States of the Commonwealth, and concerning my own State I am in a position to speak from first-hand knowledge. In North-eastern Victoria we now have between 6,000 and 7,000 acres of vineyards established on resistant stocks, which bear the most emphatic testimony to the complete success of reconstitution under Australian conditions, and should convince those doubters in regions which are still clean, who excuse the planting of ungrafted viniferas by saying that the success of the American stock under their peculiar conditions is not a matter of certainty. It is indeed strange that there should still be at this stage of our viticultural development, not only districts, but States of the Commonwealth which ignore the phylloxera danger and continue to plant new vineyards with vulnerable vinifera roots.

In the matter of reconstitution we have long since passed the experimental stage. Wherever the ungrafted European vine has prospered in pre-phylloxera days, the grafted American will, provided it be judiciously selected, give at least equal financial results. In the present paper I propose to briefly review the problem, especially in Victoria, chronicling the mistakes we have made and pointing out pitfalls to be avoided by districts as yet clean, but which will be inevitably compelled sooner or later to have recourse to the American vine, owing to the inexorable advance of the devastating aphid.

When phylloxera made its appearance in France in the sixties, and for a few years after, viticulture seemed doomed. The industry, which was second only to wheat-growing among the rural industries of France, and which has had so potent an influence on the character of the inhabitants of that great country, was menaced with destruction. French ingenuity eventually triumphed, and by the practical application of scientific principles, so characteristic of the French in other branches of industry and art, viticulture is as flourishing to-day in that country as before the first appearance of the pest.

The overcoming of the phylloxera disaster by the adoption of the American vine is one of the most striking examples of the services which science can render to plant culture. Nor was the solution of the problem so simple as might at first sight appear in view of our present knowledge—so was it with Columbus and the egg. The pioneers of the American vine had not only to fight against the administration of the day, which pinned its faith to extinction and insecticide treatment, but the stocks first tried, mainly hybrids raised with a view to fruit production, were not well suited for the purpose. The names of such sorts as Clinton, York's Madeira, Taylor, &c., are now quite forgotten. Even those which replaced them, such as Jacquez, Solonis, and various selected Aestivalis, Ruparias, and Rupestris are to-day

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scarcely used. Fifty-one years have elapsed since Gaston Bazille proposed, at the Congress held at Beaune, in Burgundy, to utilize the root system of the American vine. Since then France has taught us much, and we have now stocks suited for every soil in which vines were grown in pre-phylloxera times, and suitable for grafting with every vinifera variety from which we may wish to obtain grapes.

It is fitting that we should here record the deep debt owed to France by viticulture the world over. With her characteristic generosity the knowledge gained was unreservedly placed at every nation's disposal. Students from all countries repaired to the Montpellier School, which is to-day the Viticultural University of the world. In this well-known institution, and in many private establishments, have the wild vines of America been studied, selected, and hybridized, until to-day they are far better known in France than in their native America. Stocks raised in France and known by French names or numbers are now in general use for the establishment of vineyards the world over, America included.

Phylloxera may, it is true, be combated in various ways. Plantation in very sandy soil and submersion are applicable only in a few special cases. Examples are to be found where both are quite successful in Victoria. A sandy nature does not suffice for protection; the soil must be almost pure sand to a considerable depth. Submersion must be complete, covering the land to a depth of a few inches; it must be continued for forty days without a break, thus necessitating an impervious subsoil. Very few are the Victorian vineyards which can be thus treated. For protection to be effectual, actual submersion is indispensable; mere irrigation is hopelessly inadequate. It is necessary to here correct a dangerous error, widely held in many irrigation districts. Though irrigated vines may survive somewhat longer than those not so treated, they eventually succumb, soon reaching a stage at which cultivation is no longer profitable. The Ardmona vineyards, though irrigated, were soon destroyed, with the exception of limited areas with very sandy subsoil. Insecticide treatment—carbon bi-sulphide and sulpo-carbonate of potash—though possible in a few French vineyards yielding very high-priced vines, is out of the question under Australian conditions. The cost is absolutely prohibitive, and climatic conditions usually unsuitable.

There remains the extinction method. This must be discussed at somewhat greater length, seeing that our South Australian and Mildura friends expect so much from it. This method aims at the suppression of the invasion by the destruction of infected patches, and of a "safety zone" of sufficient width, usually 5 to 10 yards, around them. Vines and phylloxera alike are killed by injecting carbon bi-sulphide at the rate of several ounces per square yard. Replantation of the destroyed patches is not permitted under five years. If there were no winged form of phylloxera—if the insect could only spread under ground from vine to vine—this method could, if carried out in a sufficiently thorough manner, enable absolute extinction to be realized. It unfortunately presents two weak points—

1. The appearance towards the end of summer of winged insects capable of spreading infection to considerable distances, even up to 10 miles.

2. The fact that a fresh patch does not become apparent until the insect has seriously injured the root system. By this time (two or more years) numerous winged insects have been liberated, spreading the infection afar.

Hence inspection of the most rigorous nature is imperative; fresh patches must be located by means of laborious root examination, and this before there are any outward manifestations of disease.

The influence of climate on the multiplication and spread of the insect is most marked; the warmer the climate the more virulent does it become, and the longer also is its cycle of activity. I have often found active phylloxera at midwinter. The dormant period with us is very short; in some years it is practically absent. The winged insect seems also to have an unusual radius of action as compared with colder countries. I know of two distinct cases in North-eastern Victoria where fresh outbreaks 10 miles distant from older ones could only be due to the winged insect.

The futility of placing much reliance on the extinction method under Australian conditions is thus evident. Even with the most thorough inspection to locate fresh infection, one is inevitably always working far behind the outposts of the phylloxera.

In Victoria we have had experience of extinction such as should serve as a warning to districts which have yet had no experience of the disease. On the first outbreak at Geelong in 1877, an exaggerated, in fact, a truly heroic, form of extinction was decided on—the whole of the vines in this large district being eradicated. The usual safety zone was increased many hundredfold, being counted by miles instead of by yards. All vines within some 30 miles of Geelong were destroyed. It was hoped that by these drastic means extermination of the disease would be attained so far as Victoria was concerned. Vain hope! There is no case on record where an insect or fungus pest preying on vegetation has been exterminated. Once it invades a region it must be reckoned with permanently; it may be controlled, but it cannot be wiped out.

So did it prove at Geelong. So confident were the authorities of the eradication of the disease that, in the early nineties, replantation was permitted in the district. But the smouldering fire blazed out again, at first at considerable distance from the original outbreak, being discovered in the Bendigo district in 1893. It was rediscovered in the replanted vineyards at Geelong in 1898, and at about the same time fresh outbreaks were found in such widely distant localities as Rheola, Toolamba, Ardmona, and various other points in the Goulburn Valley. At Bendigo the Geelong extinction comedy was repeated, all the vineyards in the once prosperous wine-growing districts of Axe Creek, Emu Creek, and Strathfieldsaye being destroyed, not by the insect, but by the authorities, in the futile hope of eradicating the disease.

Phylloxera was first found at Rutherglen in 1899, but it must have obtained a footing there several years earlier. About this time it was also found at many other points in the North-east and Goulburn Valley.

In view of the large area infested, extinction became financially impossible. Compulsory eradication necessitates compensation, and the amount involved was altogether prohibitive. Thus was it tardily recognised that the safety of the industry lay in reconstitution on

resistant stocks; futile and costly extinction was abandoned once and for all.

The cost to the State of Victoria of eradication and compensation up to the end of 1898 amounted to £50,375 2s. 4d. at Geelong, and £37,391 5s. at Bendigo. To this must be added inspectors' salaries, &c. About £100,000 was thus absolutely wasted, or worse than wasted, since the policy entailed the destruction of two of the districts producing wines of the very highest class, without securing a mastery over the devastating insect, the spread of which was not even retarded in any way. How different would the result have been were this sum spent in propagating resistant vines and assisting growers to reconstitute their vineyards.

If we examine the results of extinction in Europe, we find that it is only in extremely cold countries that any measure of success has been achieved. In the exceptional case of the Canton de Vaud, Switzerland, results have been indeed remarkable, owing largely to the wonderful organization of the phylloxera service by the late Jean Dufour, and ably continued by his successors, but in still greater measure to the coldness of the climate. The success of the first twenty years led to the hope that phylloxera might thus be combated indefinitely. The increasingly numerous fresh patches—splashes, as they are picturesquely termed, from older ones—soon proved such hopes to be illusory, and even in this extinction stronghold the struggle has now been abandoned at many points and the American vine adopted. Even here it is recognised that extinction is but a temporary expedient, a means of gaining time for ultimate reconstitution, which alone can give permanent security. In the adjoining Cantons of Neuchatel and Geneva, in spite of similarity of climate, results were not nearly so complete, and resistant stocks came into general use much earlier.

In warmer climates extinction has proved infinitely less satisfactory—in Algeria, for example, where the climate is so similar to ours. Great were the early expectations, but in spite of a well-organized and efficient phylloxera service, it was soon found that the struggle cost more than it was worth.

Rivère and Lecq, in their fine work on *Practical Agriculture in North Africa*, published in 1914, sum up the Algerian situation as follows:—

> "To retard the spread of the scourge, extinction treatments were applied, but they had to be abandoned almost everywhere owing to the great development of the evil. . . . The only method of struggle capable of general application is reconstitution of the French vine, invaded, or threatened with ruin, by means of resistant American stocks. In Morocco, on the Algerian border, colonists have planted French vines (ungrafted). It is a grave imprudence."

As in Morocco, so also in Australia, do we find many new vineyards being established on their own non-resistant European roots. The refusal to recognise the wisdom of establishing resistant vineyards in districts as yet clean is almost incomprehensible in its improvidence, yet we find keen business men who prefer the Sword of Damocles in the shape of risk of utter destruction by phylloxera to the slight extra trouble and expense involved by establishing their vines on resistant roots, and thus insuring absolute safety. Strange excuses are often

given for this attitude—"Phylloxera will not thrive in our district"; "the heat is too great"; "irrigation will keep it in check," &c. It has ever been the same story as each new region became invaded, and such optimistic hopes have been shattered by the gradually dying vines and rapidly dwindling yields. It is very probable that, owing to the higher lime content of most of the soils, phylloxera will prove more virulent in Mildura and in South Australia than it did in North-east Victoria. French experience supports this opinion; in Beaujolais and Armagnac, where the majority of the soils are poor in lime, and rather similar to those of the reconstituted districts of Victoria, the spread of phylloxera was distinctly slower than in regions where the soils are rich in lime.

Some admit the danger, and even concede that sooner or later reconstitution will be forced upon them. The evil day is yet far distant, however—why meet trouble half way?—time enough to reconstitute when phylloxera makes its appearance; the work can then be zealously taken in hand and actively proceeded with. A fire is usually energetically fought when it breaks out, but the prudent man insures his house beforehand. So should it be with the phylloxera peril. Reconstitution is really a cheap form of insurance, entailing only a small increase in the initial cost of the vineyard: there are no yearly premiums to pay.

Those who thus favour procrastination seem to forget the difficulty of securing stocks in the panic which would inevitably ensue on the first appearance of phylloxera in such districts as, say, Mildura or Barossa. The enormous quantities of cuttings required do not materialize at will. Mother-vine plantations must be made, and several years must elapse before these could produce sufficiently. Surely it would be good policy to prepare for the evil day.

"Unsought counsel is cursed of God," says Kipling somewhere. To many vine-growers in regions where the American vine is still more or less tabu, the above remarks may savour of impertinence; I know that in some quarters I am credited with little short of monomania as regards resistant stocks. What right have I to dictate? If growers like to take the risk, surely they should be at liberty to do so. This is quite true; older growers have been abundantly warned of the danger, and are taking the risk with their eyes open.

Not so with returned soldiers, however; and it is for their enlightenment that the foregoing remarks have been penned. I feel that I should be lacking in my duty towards those to whom we owe so much if I did not clearly and forcibly warn them of the risk they are taking, should they decide to plant their vineyards with ungrafted viniferas. Even if they cannot be persuaded to establish the whole vineyard on resistant roots, it would surely be sound policy to have at least one-half of their vine area safe from destruction. The reconstitution of the other half on first signs of danger would be a very different undertaking from replacement of the whole vineyard. Needless to say the above applies only to districts as yet clean. In phylloxerated areas, such as North-east Victoria, no warning is necessary; here viticulture is out of the question without the resistant stock.

The absolute success of reconstitution no longer admits of doubt. Practically the whole of the vineyards of France which, including Algeria, now total over 4,000,000 acres, are established on resistant stocks. No other system of defence could prove so logical

or so effective. In the early days of reconstitution in France, those vineyards, still relying on insecticide treatment, were aptly compared to invalids who need doctoring during the whole course of their life, as opposed to the resistant vine for which phylloxera has no longer any terrors. Our Australian experience is quite in accord with that of France.

Let us briefly examine the influence of grafting on the three factors, yield, quality, and longevity.

Resistant vineyards yield at least as much as those on their own roots. It is indeed often claimed that they yield more heavily. To some extent they may do so, the graft operating similarly to cincturing, by restricting the free flow of sap. Grafted vines thus set their fruit rather better; hence, especially with faulty settlers, a better crop. In a general way, the replanted vineyards of Rutherglen are rather more fruitful than the ungrafted vineyards they have replaced. Perhaps this increase in production is not altogether due to the American root. Those prepared to face the heavy cost of reconstitution determined to do the thing properly, and the new vineyards have been more carefully established on better prepared soil. It is not always easy to say how much of the increased yield is due to better plantation and how much to the fact of grafting; but it is satisfactory to know that the yields of the new vineyards are certainly not inferior to those vintaged in pre-phylloxera days.

The quality of the wine yielded by the grafted vines has given rise to an enormous amount of discussion in Europe. Conservatism had to be fought inch by inch, and the prejudice against the resistant root died hard. Orchardists know well that the stock has no influence whatever on the flavour of the fruit borne by the scion; pears grafted on the quince have no trace of quince taste, and so it is with the vine. Nevertheless, fears on that score prevented, for many years, the adoption of the resistant stock in the choicest Medoc vineyards. Reputations built up during centuries were too precious to risk, and at enormous cost most of the celebrated claret vineyards combated the pest by costly insecticide treatment.

When I visited Bordeaux in 1908, many vineyards were still treated with carbon bi-sulphide, but the American vine was gradually coming into its own; it was being adopted on an increasing scale in many of the choicest and best managed vineyards. As one of the most able viticulturists of the region informed me, the slow progress of reconstitution was not so much due to misgivings concerning the quality from grafted vines as to the fear of having too many young vines coming into bearing at once. The wine yielded by old vines is always superior; and in this privileged district, where the highest possible quality is absolutely paramount, a slight increase in quality may mean doubling the value of the wine; hence the prolonging of the life of the old vines, even at almost prohibitive cost, was sound policy.

If the resistant stock has been tardily accepted at Bordeaux, no anxiety on the score of reduction in quality need be feared elsewhere.

The heresies of Professor Daniel—his theory of specific variation, and his extraordinary letter to the London *Times* of 25th April, 1908, as well as the refutation of his statements by Professor Ravaz—are now matters of history. They deserve mention because Daniel's criticism

of the quality of the wine yielded by grafted vines was about the last serious manifestation of the kind.

The only way in which it is possible for the graft to injuriously influence quality is indirectly through the increased yield which is sometimes brought about. Obviously, if the yield be very considerably increased, a corresponding reduction in the gravity of the must is to be expected.

Excessive manuring may likewise stimulate quantity at the expense of quality, but this is no argument against the judicious use of manure. Excessive fruit production is readily amenable to control at pruning time, and the practical wine-grower will scarcely condemn the American vine on this score.

The durability of the grafted vine is sometimes questioned. One of the commonest accusations made by opponents of the American vine a few years ago was that grafted vineyards would not last. As a matter of fact, there is some slight foundation of truth in the statement. Common sense will tell that a grafted vine will not last so long as one on its own roots; the graft or union is a weak point, so is it with fruit trees, but nevertheless the trees in our orchards are all grafted ones. If their duration is sufficient, why not that of the grafted vine also? And so it has been found in practice. With stocks suited to the soil, and suited to the scions with which they will be grafted—in other words, with proper attention to adaptation and affinity—the two main points governing the success of reconstitution, the duration of the grafted vine is amply sufficient.

Though the graft is, to some extent, a weak spot, the better the affinity between stock and scion the more negligible does its weakness become, and a vast number of combinations shows first class affinity, such, for example, as Syra (Shiraz) on 3309—on most stocks, in fact, seeing that it is distinctly a "good" scion—Calmette on du Lot, &c.

Extreme winter cold, such as we have no knowledge of in Australia, sometimes injures the graft. It has been found in France that the life of the grafted vine is much longer in the warm south than in the cold north—in such districts as Burgundy and Champagne, for example. This should prove most encouraging to Australians.

In France there are thousands of acres of vineyards 30 years old and over still growing strongly. In Victoria, the oldest replanted vineyard is now about 20 years old—it shows no signs of decrepitude.

Some stocks are longer lived than others. It was deficiency in this respect that led to the wane in the popularity of the Riparia. Thirty years ago this was easily the most popular stock in Europe; to-day it is planted only to a limited extent.

Coudere estimates the average useful life of the grafted vine at from 25 to 30 years in southern France, as against 15 to 20 years in the north. In Australia, we can safely reckon on from 30 to 40 years.

The scarcity of skilled labour, and the faulty pruning resulting therefrom, has in the past often caused our ungrafted vineyards to show signs of age much earlier than is the case in Europe, where the vines are treated with more tender care. Under Australian conditions, trouble is to be expected higher up than the graft; injudicious pruning mutilations will render our vines prematurely old long before the union at the graft shows signs of weakening.

From the above, it will be seen that there is no justification for hesitation to adopt the resistant vine on any of the counts commonly urged against it. The yield is equal, if not superior, to that of the ungrafted vine, the quality suffers no diminution, whilst the life of the vineyard is amply sufficient.

The cost of establishment of the vineyard is certainly somewhat higher, but not seriously so. The main difference lies in the higher price of the grafted vines if these be used at planting, or in the supplementary operation of grafting if field grafting be had recourse to.

Subsoiling prior to plantation is no doubt necessary, but even with the old vinifera on its own roots, the benefits resulting from thorough and deep preliminary working of the soil are so marked that it should really be considered necessary for it also. With the American vine it becomes absolutely indispensable, in order that its roots—which are more spreading by nature—may be induced to plunge deeply from the start, thus insuring the deep-root system so essential in a dry climate. Even under irrigation does this hold good. There are small areas of resistants in some of our irrigation settlements which are occasionally cited as proof that vineyards on resistant roots are less satisfactory than those on their own roots. Such "awful examples" have invariably been planted on improperly prepared land. I cannot too emphatically insist that it is courting failure to plant resistant stocks on land which has not been subsoiled.

If a resistant vineyard be established with due regard to a few cardinal points, financial results equal, if not superior, to those obtainable from ungrafted vines can confidently be relied on. Briefly, these points are as follows:—

1. Absolutely suitable soil. Though good results may sometimes be obtained on fair, or even mediocre soils, it is far better policy to choose only the very best.
2. Proper preliminary preparation. Subsoiling to a depth of at least 18 inches, and preferably 2 feet.
3. Due attention to questions of adaptation and affinity. Only stocks thoroughly suited to the soil and to the scion variety, the fruit of which is wanted, should be selected.
4. Recognition of the vital importance of having vines with perfect unions—whether the vineyard be planted with nursery-raised bench grafts, or field grafted.
5. Due attention to all cultural operations, whether of soil or vine, as well as control of insect and fungus pests.
6. Reduction of the yield by somewhat severe pruning at the first two vintages—particularly the first one.
7. Due attention to manuring.

In a general way, the lessons we have learnt during the past twenty years confirm French experience, though certain local differences have not been without influence.

Let us first consider the mistakes we have made.

Our first and gravest mistake, which really ante-dates the period under review, was refusal to acknowledge the resistant stock, and continuance for so many years of the futile extinction struggle. In the nineties the mere mention of the American vine was anathema. In 1899, when Messrs. Wilkinson and Gassies issued their first abridged translation of *American Vines*, by Viala and Ravaz, they were severely

criticised in official and vine-growing circles for promulgating views directly opposed to the then policy of the Agricultural Department; and yet, even then, the compensation clause (clause 9) of the Vine Diseases Act had been repealed. The keystone of the extinction system being thus knocked out, this obsolete policy crumbled immediately. The American vine received tardy recognition, and importations were made on an extensive scale.

Credit must be given to the late Joseph Bosisto, C.M.G., who was probably the first advocate of the resistant stock in Australia. On his return from a visit to France in the late eighties, he drew attention, in a letter to the Melbourne *Argus,* to the advisability of studying the wild vines of America, which promised a solution of the phylloxera problem.

Our next mistake was in not insuring sufficient supplies of grafting wood by establishing adequate plantations of mother vines. For this it is scarcely fair to blame the Agricultural Department, which could not well foresee the demand several years ahead. It takes three years before mother vines are really productive. At first the demand for resistants was erratic and uncertain. Intending planters hesitated; the success of the American vine was not yet proved, and the low prices ruling for grapes scarcely justified plantation on a large scale.

The fluctuations in the Rutherglen demand will probably be repeated in districts yet clean when they are compelled to face reconstitution; the history of the disease at Rutherglen is therefore instructive. Prior to the discovery of the insect, scepticism prevailed, most growers holding that their vines would not suffer as others had. Then came the discovery of the pest, accompanied by the usual consternation, panic, and hysterical attempts at extinction, the futility of which soon became apparent. An enthusiastic start was then made with resistant stocks, the demand for which greatly exceeded the supply.

This was succeeded by a lull; owing to several wet winters, the spread of the disease seemed to slacken; the old vines continued to yield grapes. Perhaps they were not doomed after all? The enthusiasm for resistants waned. Such hopes were, however, unfounded, and the phylloxera, getting into its stride again, wholesale devastation resulted, with which existing nurseries were unable to cope. The deficiency was largely made good by importations from France, and during the years 1909-1912, hundreds of thousands of grafted rootlings came safely through the tropics in cool storage.

The lull in the demand was responsible, in one season, for the destruction of many thousand splendid resistant rootlings, for which there were no applicants.

Wherever reconstitution has to be undertaken, the campaign must be properly organized, and requirements foreseen several years ahead. The first step should be the establishment of mother-vine plantations on a generous scale; a surplus of wood is essential, so that anything not absolutely first class may be discarded, and to provide for seasons of poor growth. The yield of cuttings is exceedingly variable, according to stock variety and season. This year, as the result of a very dry spring, our mother-vine plantations at Rutherglen and Wahgunyah, which are not irrigated, averaged only 6,000 graftable cuttings per acre, and a rather lesser number of smaller ones fit for striking as ungrafted rootlings. In good seasons, the yield is two or three times as much,

the proportion of smaller cuttings, especially, being increased. Irrigated vines yield much more wood, but it is not of quite the same grafting value.

Brief reference only is here possible to several other points of practical importance.

In a general way, adaptation has given little trouble, most of the stocks tried having proved very satisfactory. It is true that the soils of North-eastern Victoria are distinctly "easy" ones. We have had no trouble with Chlorosis, which proved so difficult a problem in the limy soils of Southern Europe. The stocks most in demand in Victoria are Rupestris de Lot; the Riparia x Rupestris hybrids, especially 3309, which is very popular; 3306 is also largely planted; whilst 101-14 is in less demand. The Franco-Americans A. R. G. 1 and 1202 are much used; whilst the Berlandieri x Riparia hybrid, 420A, has of recent years come to the fore in a remarkable manner. Nor must we forget the Cordifolia hybrids, 106-8 and 62-66, though not yet extensively planted.

In Victoria, we no longer propagate V. Riparia; it was discarded as a result of my mission to Europe in 1907-8. Though it grafts with ease, and confers a high measure of fruitfulness on the scion, the latter outgrows the stock, and after the first few years of heavy crops, stunted growth and reduced yields demand stimulation by heavy manuring. There are other stocks possessing all the qualities of Riparia without its defects, and I think we have acted wisely in discarding this stock, though I understand it is still popular in some parts of New South Wales.

From Sicily and Algeria some alarming reports have been recently received concerning the behaviour of A. R. G. 1 in some shallow, dry soils. Under these conditions, it has even been accused of insufficient phylloxera resistance. Nothing of the kind has been noted in Victoria. Even on dry hillsides it is giving excellent results; but it must be remembered that the Rutherglen soils are of a type in which phylloxera is not particularly virulent, mainly owing to their rather silty nature, and to the absence of lime in excess. Under irrigation, A. R. G. 1 is proving one of the best all-round stocks; its affinity for most scions is highly satisfactory, though 1202 is preferred for Muscats.

A stock deserving special mention is 420A, which is becoming increasingly popular, especially for field grafting, since the grafts unite with remarkable ease. This stock communicates a high measure of fruitfulness to the scion; it resists drought well; and seems to have great durability, qualities characteristic of most Berlandieri hybrids, several of which are most promising, though we have not yet used them extensively. In a general way, all the Berlandieri hybrids are better suited for field grafting than for bench-grafting. In the nursery, though the graft knits with great ease, the stock strikes too slowly to supply the scion; hence only a poor percentage of successful grafts can be relied on.

We are thus brought to the question of field grafting, the remarkable success of which under Australians conditions is becoming each year more striking. Though field grafting is the older method, it was soon superseded in France by the plantation of nursery-raised bench-grafts or grafted rootlings, which insured absolute evenness in the vineyard, since it permitted the weeding out, when lifting from the nursery, of any faulty grafts.

When I visited France in 1908, field grafting was generally looked upon as a slovenly and out-of-date method. In our more genial climate the same objections no longer apply; the spring being warmer, there are fewer gaps caused by grafts which have failed or which are faulty. So is it in Spain and Portugal, and also in Algeria, where we find J. Bertrand in his recent work (1918) emphatically stating his preference for the field graft, especially with 420A as stock. Such an attitude would have been looked upon as rank heresy in France twelve years ago.

The practical success of field grafting has been greatly promoted by the general adoption of the Yema, or Summer bud graft, performed in February, which I had the good fortune to see practised in Southern Spain in 1907, and to introduce to Victoria on my return. This graft insures a very high percentage of faultless vines, both by the perfection of the unions it usually gives, and by the second chance it provides of re-grafting, the following spring, any Yema grafts which have failed or are unsatisfactory.

Given a flawless union, it is only natural that the field graft should outstrip the bench graft. During the first season the resistant rootling, unhampered by the graft, establishes a very powerful root system. When grafted six or twelve months later, these strong roots insure such vigorous growth and rapid formation of new tissues that a very perfect union results, and this with little or no check to the growth of the stock. Numerous are the examples at Rutherglen, where field and bench grafts have been planted simultaneously side by side; at three to five years from planting the advantage is always with the former, sometimes in a most marked manner.

I hope I will not be misunderstood; I certainly do not wish to discredit the grafted rootling. Excellent vineyards can be established both ways, and at six to eight years old there is little difference between field and bench grafts. The grafted rootling will always appeal to the large grower, who often has difficulty in securing the services of skilled grafters. A very interesting grafting machine has recently been invented at Chiltern, Victoria, which should help to overcome this difficulty. Field grafting is specially suited to the careful, small grower, who does his own grafting and takes pride in his work. In his hands it is the cheaper method, and the early returns are better.

In the raising of grafted rootlings we have, at our Wahgunyah nursery, successfully followed French nursery methods. We bench graft cuttings—vinifera on to resistants—callus in artificial heat, and strike the already knitted grafted cuttings in the nursery, where they remain for eight or nine months. Success has been gratifying; in one season the percentage of perfect unions exceeded 75 per cent., though it is usually less. Under Australian conditions grafted rootlings cannot be produced for less than £10 or £12 per thousand in a good season. This will give some idea of the financial provision necessary for the establishment of a nursery.

One more word of technical advice. I must repeat the warning not to allow the grafted vine to bear too heavily at the first and second vintage—do not leave too much wood when pruning. Young vines on their own roots often suffer from over-production; in the case of grafted vines it is even more dangerous.

So much for the past and present—what of the future? I look forward to the time when viticulture will be one of our greatest rural industries, when there will be hundreds of thousands of acres under vines in the Commonwealth. I am, perhaps, an optimist; my father was so before me, as those who have read *John Bull's Vineyard* are aware. Since that little book was written, in the eighties, to describe Victorian viticulture for the Royal Colonial and Indian Exhibition, held in London in 1886, millions of gallons of Australian wine have been shipped to London. Before we can merit the above title, however, even more wine must be shipped; it will be necessary for us to supply the Mother Country with the bulk of the requirements she cannot grow herself, but for the production of which we have been so richly endowed by nature. The opportunity is ours if we will only seize it. By way of encouragement we have recently been granted a 40 per cent. Tariff preference.

The local market also is capable of enormous expansion. In France wine is the second rural industry—second only to wheat. In that great country it is considered a food, likewise in Italy and Spain; as such it found an important place in the French soldiers' ration. Bread and wine are the main dietary of the Latin countries. In the great test of war the Frenchmen proved second to none in heroism, physical fitness, and endurance, and yet the French consume more wine per head of population than any other nation. Dr. Springthorpe, one of our leading dietists, in his recent evidence before the Basic Wage Commission, stated:—

> "The Australian is a Britisher living in a Mediterranean climate (Sydney has the same isotherm as Algiers, and Melbourne the same isotherm as Florence); he is developing Latin characteristics, and will gradually go in a Latin direction of food and beverages. The combination is not unlike that which made the renaissance in Northern Italy. It is a remarkable thing how he is going in the direction of the Latin. The French call the Australians the Greek gods, and as far as race will allow them and time permit, the climate is helping them to go in that direction."

Now, gentlemen, I hold that it is a good direction, but as regards beverage the Australian will not be able to work out his destiny as predicted by Dr. Springthorpe until we make available for him at a cheap price, light natural wine such as constitutes the every-day beverage of Southern Europe, and also of South America—Argentina grows many times as much wine as Australia and consumes it all. We can produce this type of wine, which is just as necessary in our sunny land as are the fuller bodied wines we ship to England in that colder climate.

If we can gradually persuade our people to adopt light wine as their beverage, working out the evolution outlined above, we will do more for the good of the race and for true temperance than the most ardent prohibitionists could desire. Prohibition is no more a cure for intemperance—a curse all thinking men deplore—than Nihilism, or, as it is now termed, Bolshevism, has proved for the political ills of Russia.

In reconstitution on resistant stocks alone lies safety for the future, since it permits us to defy phylloxera, living with it and in spite of it; and growing any variety of vine on any soil suitable for the ungrafted vinifera. Reconstitution will enable us to fulfil our dual destiny, realizing the renaissance predicted by Dr. Springthorpe, and justifying the title of *John Bull's Vineyard* adopted by my late father in 1886.

FISH MANURE.

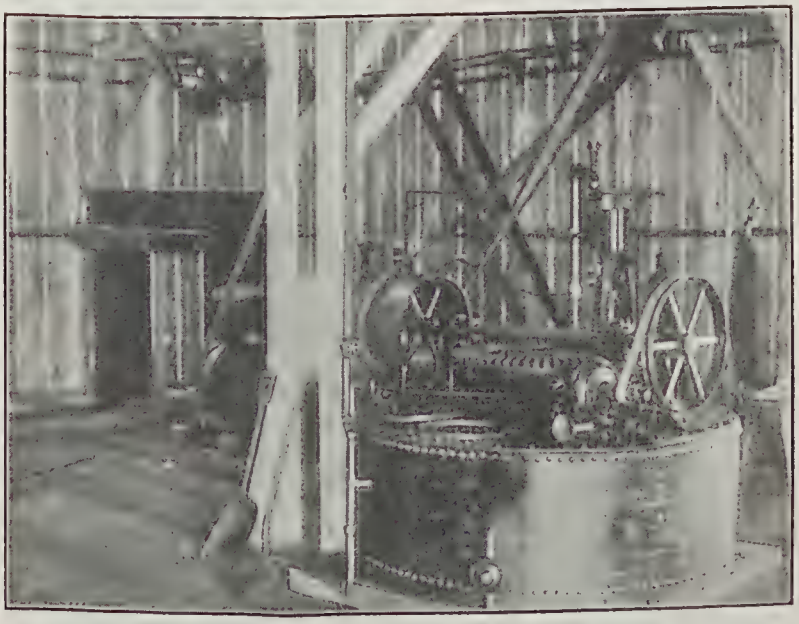
P. Rankin Scott, Chemist for Agriculture, and Will C. Robertson, Supervising Anaylst.

(Continued from page 429.)

Plant Required.

In view of the desirability of, or, rather the necessity for establishing new industries, it may be well to give some idea of the equipment required for a plant of limited capacity, together with a rough estimate of the cost and a brief description of the method of manufacture.

For operations on a small scale the plant utilized in the United States of America, consisting of the old-fashioned retort "cooker" and hydraulic press, is recommended. With the "cooker" and press is associated a "drier" heated either by a steam jacket or by internal steam coils.



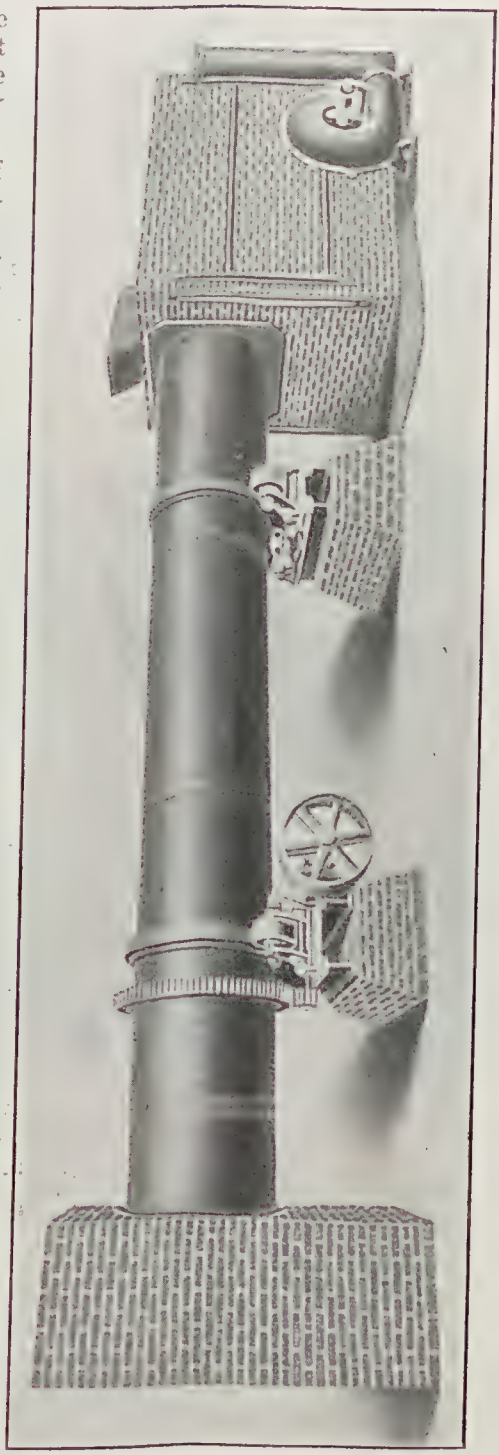
No. 1.—Small Steam Drier used in Salmon Cannery By-Products Plant. (In the Background the Press is seen.)

The "cooker" retort or digester should be of the upright or vertical cylindrical type, and for greater elasticity of operation should be installed in duplicate. The capacity of each retort, assuming 1,000 tons of fish to be the minimum quantity treated per annum, would be 2 tons. Whether the "cookers" should be of the open or closed type makes little difference; both prove satisfactory. The closed type would permit digesting under steam pressure. Beneath the retorts is a "slush" box or bin equal to holding the "cooked" charge, and provided with steam coils, so that the contents may be kept hot. As the cooked fish has to be withdrawn from the bin to the press frames, the

"cooker" should be provided with suitable gate valves at a height sufficient to permit running the "slush" to the frames by gravitation.

For pressing, the use of hop cloth envelopes (as receptacles for the "slush") and hydraulic power are required. This method is termed the "rack and cloth" press. The method of filtering is rather slow and laborious, requiring the services of two men to operate the press. An additional disadvantage is the trouble involved in the subsequent cleaning operations. This method, however, effects an efficient separation.

From the press the solid material is conveyed to the drier. A form employed with success in one small by-products plant takes the shape of a drum 6 feet in diameter and 2½ feet deep. (See illustration, No. 1.*) It is steam jacketed and insulated, and heated by steam under a pressure of 20 lbs. Paddles for stirring are attached to a vertical shaft which is worked through suitable gearings by a small engine. A rotary fan serves to remove the moisture-laden air. An opening in the top is designed for filling, and another near the bottom allows for discharging. The latter operation takes place automatically whilst the paddles revolve with the lower door open. A drier of these dimensions will take a



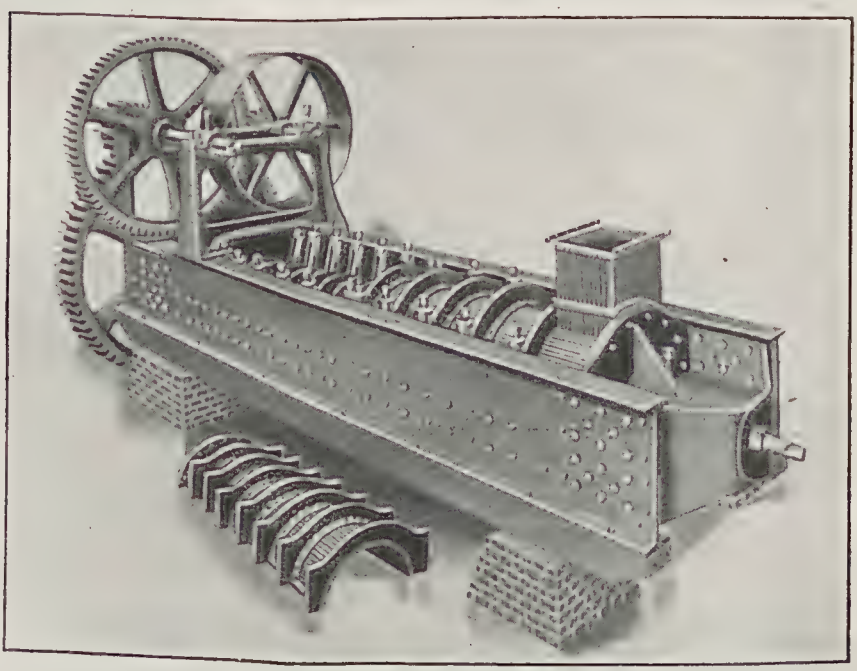
No. 2.—Hot-Air Dryer.

* All illustrations with this exception are in connexion with very large plants.

charge of 1,500 lbs. of the wet "filter" cakes; an engine of 15 h.p. would be required to operate the machine, and the drying capacity works out at 750 lbs. per hour. This drier is the one recommended for small plants, but the hot-air drier is far superior.

In addition to the retorts, slush bin, press, and drier, it would be necessary to have storage vats in which to store the hot liquid running from the press, and from which the fish oil is subsequently recovered.

These vats should be on a level below that of the press, so that the oil and water may be delivered by gravitation, otherwise a small pump would have to be installed. The vats should be heated by steam coils.



No. 3.—Automatic Power Press.

The mode of procedure is to convey the raw fish to the retorts, where it is "cooked" with or without steam pressure. The "cooked slush" is then emptied into the "slush bin," whence it gravitates to the press frames, and is transferred to the press. Here the liquid and oil is expressed and gravitates or is pumped to the "separating vats." The solid material from the press frames is conveyed to the drier, dried for a couple of hours, emptied on to the cooling floor, and is then ready for bagging.

The first "separating vat" is heated by a closed steam coil. The oil is drawn off at the top and conveyed to the second vat. Here it is heated by an open steam pipe or coil, *i.e.*, a pipe having perforations in it. The oil is finally withdrawn from this vat into the storage vat or placed in the barrels for disposal. The water and semi-solids are run off from the bottom of the vats and allowed to run to waste.

Cost.

An accurate estimate of the cost of the apparatus as described is out of the question, but from inquiries conducted in Melbourne, together with a consideration of the pre-war cost of the apparatus in the United States of America, the following approximate cost is detailed:—

	£
Two retorts or digesters 8′ × 4′—2-ton capacity, @ £300 ..	600
Press (rack and cloth hydraulic), small size	300
Drier (1,500 lbs. capacity).	500
Four vats, sheet iron—400 gals., @ £12 10s.	50
One vat (cement), 1,000 gals., say	50
Engine, 15 h.p., say	200
Incidental connexions, pipes, launders, &c.	200
Building	600
	£2,500

No. 4.—Boats Laying Nets.

Running Expenses.

It is computed that a managing engineer with the assistance of three unskilled workmen would suffice to run the small plant described, and which is designed to treat a minimum of 1,000 tons per annum. On the basis of £400 per annum as the manager's salary, plus £450 per annum as the wages of the unskilled labourers, the wages-sheet would show £850 per annum. The production of fish fertilizer would be approximately 250 tons. To sack this amount some 3,000 sacks would be required. Second-hand bags procurable at 12s. per dozen would be suitable. The outlay for bags would therefore be £150 per annum.

To contain the 20,000 gallons of oil produced yearly 500 40-gallon barrels would be necessary. The present quote for these is £1 8s. per barrel, making a further outlay of £700. To render garbage 25 lbs. of coal is said to be consumed to every ton of garbage rendered. On this basis 1,000 tons of fish would require approximately 10 tons of coal for rendering. As it requires approximately 1 ton of coal to evaporate 10 tons of water, and as probably 250 tons of water would have to be evaporated in the drier annually, 25 tons of coal would be utilized in providing the necessary heat to the drier. In addition a fuel allowance will have to be made for operating conveyors and driers —say, a further 15 tons, making 50 tons of coal used on the works per annum.

Good firewood is procurable locally delivered at the water's edge for 10s. per ton. Computing 3 tons of wood to be equal to 1 ton of coal some 150 tons of wood costing £75 would be required yearly.

A further item is the freight charges on products. On the basis of 10s. per ton, 350 tons of oil and fertilizer would cost £175 for removal to the market.

The running expenses would therefore be—

	£
Interest on capital invested—£2,500 @ 10 % ..	250
Depreciation (10 %)	250
Wages	850
Sacks	150
Barrels	700
Fuel	75
Freight charges	175
1,000 tons fish @ 25s...	1,250
Total	£3,700

Proceeds are estimated as follows:—

	£
250 tons fish manure @ £9	2,250
20,000 gallons of fish oil @ 5s...	5,000
Total	£7,250
Balance	£3,550

It should be borne in mind, firstly, that the estimation of expenditure is based on new machinery, &c., and on prices existing at present.

Bulletin 150 of the United States Department of Agriculture on the utilization of fish waste has been taken as a guide wherever possible.

The estimate of the proceeds is from quotes obtained in Melbourne during the month of March, 1920. It would be quite possible to obtain second-hand digesters, tanks, &c., in the State, and the drier and press would need to be obtained from or made by an engineering firm.

The estimates given are, if anything, conservative, and there is not the slightest doubt but that the industry is one requiring attention.

The facts may be stated in a nutshell. The one great disadvantage is the worry and uncertainty involved in collecting or obtaining the raw material.

Is fish of a suitable variety available in sufficient quantities? If so, is the necessary craft and organization—the fishermen and their fleet —ready and willing to undertake the "catch" and delivery? If these

queries be answered in the affirmative there should be little difficulty in firmly establishing the industry in Victoria—the one enthusiastic aim of the pioneers of the movement, prominent residents and fishermen of Gippsland's fishing village—Cunninghame.

No. 5.—Fishing Steamer.

POTASH FROM KELP IN AUSTRALIA.

At the instigation of the Institute of Science and Industry analyses have been made of a number of specimens of kelp collected at various places off the Australian coast, with a view to determining their iodine and potash contents. On the average, the potash contents of the ash was shown to be about 14 per cent., although individual samples have yielded as high as 30 per cent. Before any expression of opinion could possibly be given as to the likelihood of a new commercial source of potash being developed, much further investigation would be necessary, and this would involve a great deal of expense. In the first place, there would need to be a thorough exploration of the fields of kelp, in order to determine their extent and also the suitability of their location for continuous harvesting. If collection were rendered intermittent on account of rough seas, stoppages would seriously tend, even where fields were dense, to make the recovery unprofitable. In California very large sums of money are being spent upon the experimental work in progress, and the results of the work are being followed with close interest by many countries.

AGRICULTURAL SOCIETIES' WORK.

MAGNIFICENT OPPORTUNITY FOR UNITED ACTION.

By J. S. McFadzean, Senior Dairy Supervisor.

One of the most popular of rural institutions in Victoria is the agricultural society. Almost every town of any note has such an organization, while in the smaller centres a district society is formed. By each of these an annual show is usually held, whereat prizes are given for the best exhibits of all classes of domestic stock, grain, fruit, vegetables, &c., and the competition creates great local interest in the event.

The principal benefit resulting from these shows is the incentive to raise better stock and produce each year in order to win prizes, with a consequent tendency amongst the farmers of each district to improved stock-breeding and agricultural methods. These societies are certain to have amongst their members some of the most energetic men of the district, who do their utmost to make the annual show a success, and who usually succeed. In fact, adverse weather is about the only thing likely to seriously interfere with the result, for with a committee picked from successful professional men, business men, and farmers, all enthusiastic and spreading enthusiasm, all applying themselves to make their show attractive, almost any undertaking would be made a success.

That the members of agricultural societies have also every desire to improve agricultural conditions throughout their districts is demonstrated by each society being represented at the Farmers' Conference which is held annually in one of the several rural centres throughout the State. Delegates there bring forward for discussion subjects of general interest in order that, if approved, they may be taken up by all the societies and pushed on to their end, each society in this way having the support of all others on any matter affecting rural welfare. Much good has already been achieved in this way, and each year the influence of Agricultural Societies is increasing.

The object of this article is put forward a suggestion, which is fully within their province, and one which could be economically carried out only with their assistance. If adopted, there can be no doubt it would confer continually widening and increasing benefit to the whole community.

Some three years ago the indiscriminate slaughter of heifer calves throughout the State attracted attention to such an extent that it was even proposed to prevent it by legislation; but, as it was then considered by many that this condition would ultimately right itself, no action was taken. This optimistic view has, however, proved wrong, and the harmful results then foretold are now apparent to all. The destruction of the best heifer calves is still going on, and throughout the whole State the effect of this slaughtering, which was so general even four years ago, is now showing in the price of dairy produce; and unless a counteracting move is quickly made, every one—farmer as well as city dweller—will be called on to suffer financially for it at a continually increasing rate.

Milk, butter, and cheese are amongst the most important necessaries of our daily food, and their cost of production and selling price affects

every one, therefore it is every one's business to look closely into the cause of any variation in the supply.

The price of dairy cattle rises or falls with the price of dairy produce, and *vice versâ*, but the number and quality of cattle in the State is the primary factor in maintaining a good supply of produce. While the demand for dairy produce is constant, the supply will vary greatly according to the seasons being favorable or otherwise. Dry weather reduces the supply of milk by lessening the amount of green feed available for the cattle. Extended stretches of dry weather have caused much losses of stock through actual starvation, and even a shortage of succulent feed brings about mortality amongst stock consequent on their not being properly nourished, for they are then less able to resist disease. Every protracted period of dry weather has thus a reducing influence on the supply of milk, and the price both of dairy cattle and produce rises accordingly.

Under even average conditions the State cannot afford to have any large number of heifer calves slaughtered in any year, for the ordinary upkeep of the herds is of much importance. Of late years a big oversea trade in concentrated and condensed milk has been established in Victoria, and the milk of thousands of cows which formerly went to the manufacture of cheese and butter is now taken by this oversea trade, and butter and cheese prices have consequently risen. To have fully met the demands of this oversea trade all these heifers, which three and four years ago were slaughtered for veal, should have been saved, and, as the slaughtering continues, the greater the oversea trade is in milk the heavier will be the shortage in the dairy produce required for local consumption. Another phase of the situation is that high prices ruling for veal and beef have encouraged the raising of big-framed calves of the beef type rather than the lighter-framed dairy stock, and a large proportion of such heifer calves as are being raised are more suitable for the butcher than for dairy work. Therefore, while the population of the State is continually increasing, and the demand for dairy produce for both local and oversea consumption is ever advancing, the number of dairy cows is gradually falling further and further short of actual requirements, and the quality generally is not improving as it should.

Where highest prices are obtainable for milk, naturally the highest prices are obtainable for good cows. The very top market prices for cows are paid by those dairymen who supply the city fresh-milk trade and the condenseries, and a large proportion of the best cows in the State are to be found in the herds of these two classes of dairymen, and fewer calves are raised there than elsewhere. All the milk their cows yield brings the top market rate, and these dairymen usually consider that they cannot afford to use any for calf-raising. This means that few, if any, of the female progeny of the best dairy cows in the State are being raised for dairy heifers, they being usually killed for veal within a few weeks of their birth.

Further than this, where milk is separated and calves are raised, comparatively little attention is being given to the quality of the cattle kept. Only a handful of Victorian dairymen follow any system of testing and culling their herds and breeding from selected stock. So long as they can live on their work—and the high prices prevailing are so far assisting them well in this—they have little heed of the future.

But as soon as a slump in dairy produce prices does occur the seriousness of the situation will more forcibly demonstrate itself, and once more will be heard the plaint of the man with inferior milking stock, "dairying does not pay."

What is everybody's business is, as we know, attended to by nobody. Heifer calves of good dairy quality are still being killed in large numbers for veal, and inferior calves bred from all kinds of crossbred cattle are being reared for dairying, and nothing is being done to correct these conditions.

Every farmer knows that the right and profitable method is to test his cows regularly, and breed only from those which will give best returns for the cost of grazing and handling them, but not 5 per cent. of them are doing it, and under careless working methods the annual production in milk and butter fat per cow is more likely to decrease than increase. If the dairying business of each farm, and the industry as a whole, is to make progress here, there is urgent need for systematic concerted action, and it lies with agricultural societies to take the first step in this work.

Each society has active members throughout the whole district it represents, many of them being dairy farmers. It would be a comparatively simple matter for every society, through its members, to learn the number of calves raised each year by local farmers, and also the average number of heifer calves killed from those farms where young stock are not raised. The next step would be to collect the calves from the best milking cows in each herd that would otherwise be slaughtered, and have them raised on other farms, replacing the progeny of inferior stock. Almost every herd has some proportion of good cows, which any good judge of stock could pick out as being heavy milkers, and the heifer calves from these should never be slaughtered. Were all herds tested, such selection would certainly be made with much more accuracy, but until this is possible the best available method of selection should be applied.

Upon each owner notifying, through the society, a willingness to take part in the scheme, a judge of dairy stock could be appointed to inspect each herd, and point out those cows from which heifer calves might be selected, taking at the same time particulars as to description of cattle, and date of calvings; and, for use in connexion with future breeding, a note could be made of the owner's choice in the breed of a stud bull. The adjustment of prices to be paid for scrub calves for slaughter, for raising of approved calves to specified ages, for the purchase of stud bulls, &c., are all items which could be arranged on the basis of previous sales in the respective herds, the terms of which could safely be left to delegates from committees of societies in defined areas throughout the State.

There are several hundred cows in pure-bred herds which are now being tested as to their annual production of milk and butter-fat, and from the progeny of these many stud bulls will be raised which might be of great value in raising the future quality of dairy stock. Every owner of a herd from which heifer calves are raised should have one of these pedigreed dairy bulls with which to make the best of his cows as judged on appearance if not yet on test, and with the aid of the agricultural societies this can easily be done. It will be a simple matter to

ear-mark all heifer calves from the picked cows, and, where necessary, have them transferred to other farms, where they will be reared and cared for. If the farmer who raises them intends to keep them for future dairy work, it will be to his advantage to get these selected heifer calves to rear instead of those he has been raising from inferior milking stock. Again, many of those farmers who now raise vealers might, by the payment of a bonus covering the cost of rearing, be induced to raise these heifer calves to, say, five months old, when they could be collected and sold out again as the demand for them occurred.

The co-operation of agricultural societies is, however, absolutely essential in carrying through this proposition. With them would rest the collecting of the names of both the farmers who kill off their calves and those who raise them; and it would be for the agricultural societies also to make certain that only selected stud bulls were used with the selected cows in each herd from which the heifer calves were collected and raised for dairy purposes. The society's brand or ear-mark would be a guarantee that, at least, each of these heifer calves was of a much higher grade for dairy work than those from ordinary farm stock, and it would give them an enhanced value.

When the farming community recognises the seriousness of both the present shortage of good dairy heifers and the inferior quality of those cows which are offering in the markets, they will find the remedy suggested here simple, and it can be put into almost immediate operation through the various agricultural societies.

The main point is that heifer calves from some of the best of the dairy cows in the State are being killed each year, while others are being reared which should be killed for butcher's meat. The desired adjustment of these two unfortunate situations is possible of being quickly and effectively made if each and all of the agricultural societies will only give their attention to the matter. It is a movement which the State can assist in, but the first step might well come from the farmers themselves through those societies which they have formed for the protection and advancement of their own interests.

AUSTRALIAN EGG RECORDS.

A. V. D. Rintoul, N.D.D., Chief Poultry Expert.

The marvellous fecundity of the birds in the various Egg-Laying Contests throughout Australia has attracted world-wide interest, and the scores from the various Government official tests are available by the courtesy of the poultry experts of their respective States. In addition to the official tests, there are in Victoria a number of other competitions, and whilst in no way doubting the absolute genuineness of these, or the capability of those responsible for the management of such competitions, their returns cannot, of course, be recognised as official scores.

In some unofficial competitions a light and a heavy breed fowl are put in one pen, and the colour of the shell is the determining factor in deciding which bird actually laid the egg.

In New Zealand, whilst there is no official Government competition, the Government pays a subsidy to each of three competitions now being conducted, the best scores so far having been recorded at Christchurch.

Victorians will be glad to notice that the highest score for a team of six birds for twelve months in any of the competitions was recorded at Burnley by Mr. W. N. O'Mullane's White Leghorns in 1914-15. These birds were fed on the dry mash system.

The highest individual single test scores was also made at Burnley in 1917-18 by Mr. C. E. Graham's Black Orpington, which laid 335 eggs, averaging about 27 ounces to the dozen.

In 1918-19 Mr. R. Burns' Black Orpington also scored 335 at Gatton College, Queensland, but did not lay so large an egg as Mr. Graham's bird.

The following are the best on record:—

Official Scores—Teams of Six.

Name.	Breed.	Year.	No. of Eggs.	Locality.
*W. N. O'Mullane ..	White Leghorns ..	1914–15	1,699	Burnley, Victoria
J. H. Gill	,, ,, ..	1913–14	1,667	,, ,,
G. McDonnell ..	,, ,, ..	1915–16	1,661	,, ,,
E. Chester	,, ,, ..	1917–18	1,652	Gatton, Queensland
*W. H. Robbins ..	,, ,, ..	1915–16	1,638	Burnley, Victoria
H. McKenzie and Son	,, ,, ..	,,	1,637	,, ,,
Mrs. H. Stevenson ..	,, ,, ..	1914–15	1,633	,, ,,
W. M. Bayles ..	,, ,, ..	1915–16	1,623	,, ,,
T. Fanning ..	,, ,, ..	1919–20	1,627	Gatton, Queensland
R. Holmes ..	Black Orpingtons	,,	1,619	,, ,,
C. Judson	,, ,,	1917–18	1,613	Hawkesbury, N.S.W
G. McDonnell (Vic.) ..	White Leghorns ..	1919–20	1,603	Parafield, South Australia
H. McKenzie and Son	,, ,, ..	1915–16	1,601	Burnley, Victoria

Official Individual Scores.

C. E. Graham ..	Black Orpington	1917–18	335	Burnley, Victoria
R. Burns	,, ,,	1918–19	335	Gatton, Queensland
R. Burns	,, ,,	1917–18	334	,, ,,
A. Drayton	,, ,,	1918–19	324	Hawkesbury, N.S.W.
R. Holmes	,, ,,	,,	317	Gatton, Queensland
P. C. McDonnell ..	,, ,,	1916–17	312	Hawkesbury, N.S.W.
C. Judson	,, ,,	1917–18	312	,, ,,
†P. N. Tilley ..	White Leghorn ..	1919–20	312	Burnley, Victoria
W. H. Appleyard ..	,, ,, ..	1916–17	308	Hawkesbury, N.S.W.
C. Judson	Black Orpington	1917–18	305	,, ,,
Dixie Egg Plant ..	White Leghorn ..	1918–19	303	Gatton, Queensland
J. Ryan	,, ,, ..	1919–20	303	Burnley, Victoria
A. Drayton	Black Orpington	,,	303	Hawkesbury, N.S.W.
L. G. Innes	White Leghorn ..	1918–19	302	Gatton, Queensland
Rogan and Andrew ..	,, ,, ..	1917–18	301	Burnley, Victoria
Mrs. F. Skinner ..	,, ,, ..	1916–17	300	Hawkesbury, N.S.W.
V. C. Genoud ..	,, ,, ..	1919–20	300	Parafield, South Australia

* Dry Mash. † Trap Nest.

FARM NOTES FOR JULY.

NOTES ON EXPERIMENTAL WORK, STATE RESEARCH FARM, WERRIBEE.

George S. Gordon, Field Officer.

Seasonal Conditions.

Crops on the experimental areas, with few exceptions, are looking well, notwithstanding the small rainfall. Rain fell on twelve days during July, but the total amount registered was only 98 points. This is considerably below the average for the month, and makes a shortage of almost 3½ inches for the first seven months of the year. It is not too late in the season to hope that this shortage may be made up, but unless sufficient rain falls during the remainder of the growing period the dry winter will be reflected in the harvest yields. Severe frosts were experienced, and both soil and air temperatures were low.

Crops.

The cold dry conditions have prevented a satisfactory germination of shallow-sown seeds such as Rape, and even where this crop was re-sown the plants have not appeared. Cereals sown towards the end of the seeding season are making a comparatively slow growth. Flax, too, is making a very weak growth, and this has enabled small insects known as pea mites to practically ruin some of the plots. Spraying has not proved beneficial. Some of the selections, however, are either more vigorous or in some way unpalatable to the mites, and these are holding their own fairly well. The experimental plots of Barley have germinated well. In the stud cereal, "Selection" and Wheat Variety Plots the early wheats are showing the erect habit of growth characteristic of these varieties, and a few of the outstanding features in the other sections may be summarized as follows:—

Oat Variety Tests.

The plots of Glen Innes, Sunrise, Lachlan, and Guyra Oats at present show a much more forward and erect growth than the well-known variety Algerian, but the latter makes its best growth in the warmer weather, and if it does not attain the height of some of the varieties mentioned, it has in the past generally given a greater yield of grain at Werribee.

Permanent Manurial Field.

A rather thin germination has been attained in this field, but all the "Super." plots stand out prominently, and have a better growth than even the plots which received 10 tons of stable manure per acre. The best looking plot at present is that which received super. 1 cwt., and Sulphate of Potash ½ cwt. per acre. This is rather strange, as the application of Potash has not given encouraging results in past years.

Green Manurial Rotation Field.

The ten 1-acre plots of wheat in this field are looking particularly well, and the feeding off tests on the green crops have been commenced. Barley seems to have "stood up" to the seasonal conditions, and has made a better winter growth than Oats, but from past experience the latter crop is expected to provide feed over a longer period. The peas, sown later, are coming along fairly well, but the rape has had to be re-sown, and the plots are still bare.

Permanent Rotation Field.

As might be expected, the most promising crops in this section are those sown on plots fallowed during 1919, particularly where the fallow succeeded a different crop from that grown this year.

Flax Tests 1919.

Last season's experimental plots of flax were irrigated twice, and the watering caused such a strong growth of "wire-weed" that it was decided to treat the crop as a Linseed proposition and strip the plots for seed. The irrigation was probably also the cause of the somewhat erratic results obtained from the manurial section of the field. The following points are worth placing on record for the information of growers:—

1. *Manurial Section.*—Bonedust or a combination of bonedust and superphosphate were the fertilizers which gave the best results. Sulphate of Potash seemed slightly beneficial, but Nitrate of Soda apparently reduced the yield of seed.

2. *Rate of Seeding Section.*—Duplicate plots sown with 18 lbs., 28 lbs., and 42 lbs. of seed per acre gave the gradually ascending yields of 13.9, 15.7, and 16.9 bushels per acre respectively, while heavier seeding failed to increase the yield.

3. *Rate of Seeding and Time of Sowing.*—The results from these plots are easily in favour of early sowing as indicated by the following table:—

Seed Sown per Acre.	½ Bushel.	1 Bushel.	1½ Bushels.
	Bushel.	Bushel.	Bushel.
Yield per acre from early-sown seed, 14/5/19 ..	12·0	13·9	11·6
Yield per acre from late-sown seed, 27/6/19 ..	2·7	9·2	7·4

One bushel of seed has given the best yield in each section, but it will be noticed that the heavier seedings in the late sown plots have yielded proportionately better than those sown early. It would thus seem that for linseed production it is advisable to increase the rate of seed sown as the season advances. This is in keeping with the experience regarding wheat.

Variety Tests.

In these plots a number of new varieties from other countries were tried for the first time, but for fibre purposes none of these was equal to the Werribee Fibre Selection $\frac{20}{4}$ and Blue Blossom. These two varieties, however, germinated badly, and the yield of seed was low because of the thin crop. Notwithstanding this, they were the tallest varieties grown, and the plants showed no inclination to tiller. Blue Blossom is not quite so tall as the Fibre Selection, but it seems somewhat finer stemmed. The only variety to give a better yield of seed than the Werribee seed selection, known as Northern Linseed, was one from America, but called Japan Flax. All the seed of the two best fibre and seed types has been sown in larger plots this year, and their behaviour will be further studied.

Linseed Production.

The present price of Linseed is about £1 per bushel, and at this figure the yields obtained from the best of the plots grown in 1919 would return handsome profits; even if the price dropped considerably, the growing of suitable varieties of flax for linseed as well as for fibre ought to prove a profitable undertaking.

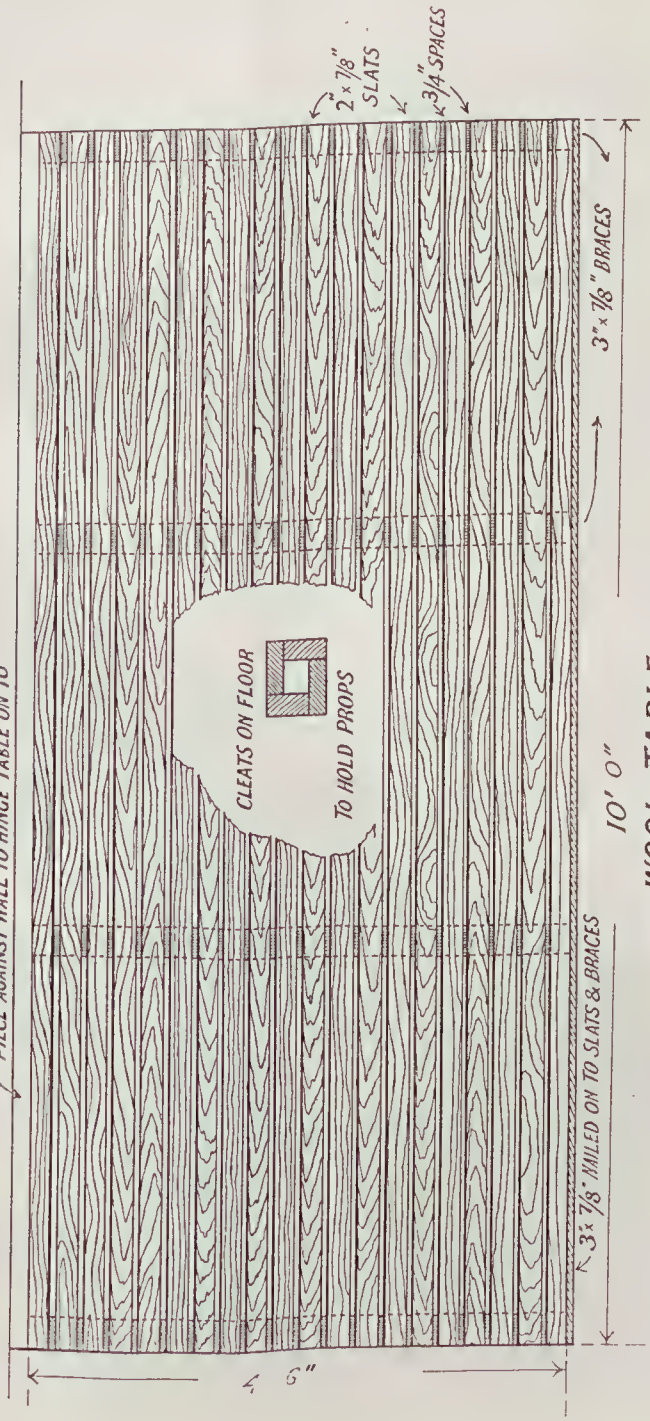
WOOL TABLE.

By H. W. Ham.

On the opposite page a design of a suitable wool table for small holdings is shown. Such a table would be 10 feet long by 4 ft. 6 in. wide, made of softwood slats 2 in. by $\frac{1}{8}$ in., with spacings of $\frac{3}{4}$ in. to four cross pieces 3 in. by $\frac{1}{8}$ in. It is better to have it of a size that the skirtings may be kept on the table instead of on the floor, for if there be plenty of room, the tendency to extravagant skirting is reduced.

On a small farm, there is no necessity to make the wool table a fixture, as is required where a large flock is run. Instead of substantial table legs, trestles may be used, so that they may be folded and the table put away when not required. The space could then be used for grain, &c.

Perhaps a better arrangement still would be to fasten the table to the wall with hinges, and to support the front with props, also attached by hinges. The whole could then be folded to the wall at the conclusion of shearing. If attached to the wall, as suggested, the table should slope from back to front, so that the back could be easily reached. The props should rest in cleats, so as to prevent them slipping.


2" × 7/8" SLATS
3/4" SPACES
3" × 7/8" BRACES
PIECE AGAINST WALL TO HINGE TABLE ON TO
CLEATS ON FLOOR
TO HOLD PROPS
10' 0"
3" × 7/8" NAILED ON TO SLATS & BRACES
4' 6"
WOOL TABLE

ORCHARD AND GARDEN NOTES.

(*E. E. Pescott, F.L.S., Pomologist.*)

The Orchard.

If the winter spraying has been delayed, it should be completed as quickly as possible, and before the buds begin to swell and burst.

It is not advisable to spray the stone fruits with the red oil emulsion at this time, as there is danger of burning and destroying the early buds that may be swelling, and consequently loosen their outside scales It will be safe, if the work be done at once, to spray apple, pear and quince trees with this spray, especially where the Eyrobia Mite, scale insects, or woolly aphis are prevalent.

If it is intended that the lime-sulphur wash be the specific for these and other pests, it may be used with safety, although the spraying should be completed as early as possible.

That the lime sulphur is valuable as a specific against "Black Spot" of the apple was shown in the report of the experiments in the *Journal of Agriculture* for August, 1918. The first spray should be given when the flower buds are more green than pink; and the second spray, when the centre flowers of the blossom cluster are pretty open.

The same report showed that a spray of 6.8.40 of copper-soda, sprayed when the earliest buds were showing pink, was a complete success against the "leaf curl" of the peach.

Where peach aphis has appeared, it will be advisable to spray at once with a strong nicotine solution. Tobacco stems should be soaked in cold water for some days, and a teaspoonful of caustic soda added to a cask of steeping stems. The liquid should be made strong, and every endeavour made to kill out the first insects that appear.

The pruning of deciduous trees should be at an end this month The pruning of evergreens such as oranges, lemons, and guavas, may be left until later.

Young deciduous trees must be planted not later than this month. The soil should be trodden firm round the roots, and, when planting has been completed, the tree ought to be headed back to three or four buds on each arm.

Preparation may be made for planting citrus and other evergreen trees. It is necessary that the soil be well ploughed and sweetened in anticipation of planting in September and October.

In root-borer affected districts, the beetles will begin to appear during the latter part of the month. A close observance should be kept on them and the insects regularly collected and destroyed.

The Flower Garden.

All winter-flowering shrubs that have dropped their blossoms may now be pruned. It is important to prune these immediately after flowering, so that the plant may be able to make plenty of flowering wood for next season.

Seed beds and plots need constant cleaning and weeding. Weeds must now be kept out of the garden, both by hoeing and hand picking. The seedlings growing in their permanent situations should be thinned out and given a good chance to develop strong and sturdy plants.

Divisions of herbaceous plants such as delphiniums, cannas, shasta daisy, herbaceous chrysanthemums, rudbeckias, salvias, and phlox, may still be planted out. If it is intended to leave the plants in the places they occupied last season, they should be lifted, the soil being well dug and manured, and the crowns planted back again. By this means the plants retain their vigour, and are able to produce good flowers each season.

Evergeen shrubs may now be planted out, if the spots chosen for them have been well dug and aired. All beds should be well dug over by this time, manure and refuse litter having been dug into the soil.

A few corms and tubers of early summer flowering bulbous plants may now be planted.

The Vegetable Garden.

The plots should be well dug over at this time, adding gypsum or lime where any pests have been prevalent. In other beds stable manure should be well worked into the soil.

The soil should be rich, well worked, and warm, so that a quick growth may result. Vegetables quickly raised are generally more tender than slowly grown ones; and frequent changes of crops in the plots will give better results. At this season, the weeds will require constant checking; frequent use of the hoe will, therefore, be necessary, and in the rows hand-weeding should be resorted to.

All seedlings should be planted out, especially seedlings of cabbage, cauliflower, lettuce, and onion. Seeds of peas, carrots, parsnips, radish, lettuce, tomato, and broad beans may be sown.

Where they can be sheltered and protected from frosts, young tomato plants may be planted out for early fruiting. One method of managing these early plants is to place the young plant a few inches below the surface, and then a box, 8 or 9 inches deep, with top and bottom removed, over the plant at ground level. This can then be covered loosely with a piece of glass whenever necessary.

Potatoes, artichokes, and asparagus crowns may be planted. Asparagus beds should be kept free from weeds; they should have a loose surface, and a light top dressing with old manure would be beneficial.

In the frames, cucumber, vegetable marrow, melon, pumpkin, water and rock melon seeds may be planted. These are best planted in pots placing three or four seeds in each pot; they then suffer no check when being transplanted into beds.

REMINDERS FOR SEPTEMBER.

LIVE STOCK.

Horses.—Feed stabled horses well; give green stuff if available. Continue rugging to encourage the shedding of the coat; good grooming will also be beneficial. Give hay or straw to grass-fed working horses. Feed old and badly-conditioned horses liberally. In foal mares due to foal early, if worked, should be turned out to paddock. Stallions doing stud duty should be fed liberally. Equivalent amount of cracked Indian corn (maize) may with advantage be substituted for oats, if latter grain is scarce.

Cattle.—Cows should still be rugged, but coverings should be removed frequently, in order to enable the animal to get rid of the old coat; or, better still, a good curry-combing may be given. Continue hay or straw. Look up treatment for milk fever in *Year-Book of Agriculture*, 1905, and treat cattle accordingly. Give calves a good warm dry shed. Give the milk to young calves at blood heat. Have feeding troughs or buckets clean. Don't over-feed. Feed regularly with regard to quantity and time. Provide a good grass run, or fine hay or crushed oats in a box or trough. Give a cupful of limewater per calf per day in the milk. The problem with many at the present time is how to rear calves without milk. This can be done very well by starting them on new milk for a fortnight, and then gradually substituting the milk with one of the calf meals on the market. To these it would be advisable to add two or three tablespoonfuls of cod liver oil. The following meal is in general use in Ireland :— Two parts, by weight, of oatmeal, 2 parts maize meal, 1 part pure ground linseed, all finely ground. Scald with boiling water, and allow to stand for twelve hours. Start with new milk, then gradually substitute skim and ¼ lb. of the meal mixture per head per day, gradually increasing to 1 lb. or more. In a month milk may be dispensed with altogether. The crushed oats, fed dry, have been found to give excellent results.

Sheep.—Wherever early shearing is possible, and shelter available, all sheep to be disposed of can be fattened earlier, if shorn. Heavily woolled merino sheep, and lambs not good enough for freezing also thrive better after being shorn. Where insufficient knowledge of grading cross-bred wool exists, draft the coarse sheep from the fine before coming into the shed, and shear and bale separately. Clean all daggy sheep before bringing them on to the shearing board. Avoid deep and careless skirting. Only dense seedy parts, and heavy fribs and stains should come off fleeces. Press in a box press, which forms square sides to bales and avoid round bales, called "Sew Downs." Pack in all possible. Brand boldly and neatly on the long and narrow side. Clean carefully all straw, chaff, &c., from shearing place. Cut back all misshapen feet when noticed during shearing. Mark all "duggy udder" ewes for disposal, and all black-marked and inferior-fleeced sheep.

Yard and go through all well-bred Merino-Lincoln cross lambs before offering to exporters. Select, ear mark, and shear all best sorts for future breeding and shearing. Buyers will find shafty, well bred, fine to medium grade wools disappointingly scarce for years.

Pigs.—Supply plenty of bedding in warm well-ventilated sties. Keep sties clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. If pigs are lousy dress with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect sties. Worms are very prevalent at present, and may be treated by giving 2 to 10 grains of Santonin in form of pill, or from half to one teaspoonful of oil of turpentine in milk or castor oil.

The automatic feeder system is proving very satisfactory and economical. Give it a trial. *See* Bulletin No. 16, page 76.

Poultry.—September is one of the best months for hatching for winter eggs. Incubators should be kept going, and broody hens set. Care must be taken to keep down vermin, as they now breed quickly; use sprays in houses and Insectibane or Izal in nests—nothing stunts chickens quicker than vermin. The food

for young chicks should be fine oatmeal, stale bread crumbs or biscuit meal, a little calcined bird's grit, a little chopped green stuff such as lettuce, thistles, or green lucerne or spring onions occasionally cut fine is a good tonic, and a pinch of powdered charcoal. Slightly moisten with new milk. Make the whole friable, and feed frequently ("little and often") just as much as they will readily eat, as an excess of food only sours and disturbs their digestive organs. Animal food may be given in small quantities after the first ten days once or twice a week. Chickens should be protected from damp ground and the cold, bleak winds.

CULTIVATION.

FARM.—Plant early potatoes, and work up fallow for the main crop. Keep fallow for summer forage crops well worked up with the disc and harrows. Make early sowings of mangolds, beet, field carrots, and turnips. Push on with the fallowing in the Northern Districts. Prepare land for tobacco seed beds by burning rubbish on the site; afterwards work up to depth of three or four inches.

ORCHARD.—Commence spring ploughing; plough in leguminous crops for green manure as soon as the plants are in full flower. Finish grafting early in the month. Spray peach and apricot trees with copper soda as the blossom buds are opening, as a preventive of "leaf curl" and "shot hole" fungi; watch for peach aphis, and spray when present with tobacco solution.

FLOWER GARDEN.—Cultivate and work up the surface to a fine tilth—clear out all weeds. Water newly-planted shrubs, &c., if the weather is dry. Plant out cannas, early dahlias, chrysanthemums, gladioli, and other herbaceous plants.

VEGETABLE GARDEN.—Plant out seedlings. Sow seeds for summer use, such as tomatoes, cucumbers, marrows, pumpkins, melons, &c. Plant out tomatoes, and shelter till frosts are over. Hoe and work up the soil surface.

VINEYARD.—Plantation of young vines (grafted or ungrafted) should be concluded before the commencement of September; pruning of old vines likewise, as well as tying down of rods on long-pruned vines. Prune recently-planted vines just before buds commence to swell (if not pruned when planted) cutting strongest cane back to two buds. Do not delay this work until buds have shot, as this seriously weakens the young vine. Field grafting may be carried out, if weather be fine and warm. If cold and wet, postpone until October. Swab vines preventively with acid iron sulphate to protect them from Black spot. Though only slight damage was done last season, the fungus is not dead, but dormant, and is sure to re-appear should the spring be a wet one. To avoid burning, swabbing must be completed before the buds commence to swell. (See articles in issues of July, 1917 and 1918, reprints of which will be posted on application.) Cultivation (scarifying or discing) must receive attention when soil is in suitable condition.

Cellar.—Conclude spring racking early in month, if not already done. Fill up, regularly, all unfortified wines.

LOPPING OF OAK TREES.

A correspondent asks if English oak trees can be lopped without injury to the main part of the tree.

The answer is that lopping will not injure the tree. The limbs should be sawn off. The wounds should be smoothed especially round the edges and dressed with lead paint. It is advisable to cut the limbs as close to the trunk or main arms as possible. They should be cut on the slope so that the shedding of water will be facilitated.

GERMINATING POWER OF WHEAT.

"How long does wheat retain its powers of germination," is a question that was recently put to the South Australian Director of Agriculture (Professor Arthur J. Perkins). "I do not know that any very definite statement on the subject can be given, except to the extent that the germinating power of most grain tends to weaken with age," the Director replied. "Put it in this way if you like: If you have grain, the germinating power of which is 100 per cent. in 1920, it is probable that in 1921 there will be a slight reduction in the germinating power, let us say 95 per cent., and so on from year to year there will be individual grain that will die off and lose its power of germination. I have known of cases in which individual grains have germinated ten years after harvesting, but this does not mean that a ten-year-old sample, as a whole, would be worth sowing. Much, too, depends on the way in which the grain has been kept. There are conditions which lead to loss of germination more rapidly than others. Low temperature, for example, accompanied by a complete freedom from moisture, will protect the grain for a considerable length of time. Heat, on the other hand, particularly when accompanied by moisture, will rapidly cause deterioration. Similarly, I am of the opinion that lengthy storage in large bulk reduces the germinating power of the grain, without, however affecting its quality from the point of view of foodstuff.—*The Journal of the Department of Agriculture of South Australia*, July, 1920.

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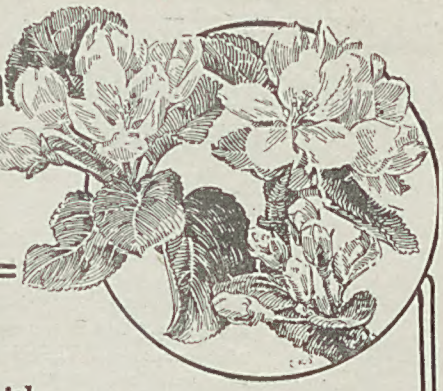

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RHODE ISLAND REDS

Pure Dalrymple—Imported Laying Strains

No. 1—From SINGLE TESTED HENS, 250 to 275, mated to a Cock bred from a 264 Hen
Price, £2 2/-

No. 2—From Hens bred from above mated to Cockerels bred from imported birds **Price, £1 1/-**

To allow for infertile eggs sixteen eggs will be forwarded for each sitting. No guarantee of fertility or replacements will therefore be made.

A limited number of Cockerels bred from birds specified above are available for sale. **Price, £2 2/-** and **£1 1/-** each.

Postal Order or Cheque should accompany Order, which should be addressed to the

MANAGER, RESEARCH FARM, WERRIBEE

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